FLIGHT
and
AIRCRAFT ENGINEER

Editorial Director G. GEOFFREY SMITH, M.B.E.
Editor - - C. M. POULSEN
Assistant Editor - MAURICE A. SMITH, D.F.C. (WING CDR., R.A.F.V.R.)
Art Editor - - JOHN YOXALL

FIRST AERONAUTICAL WEEKLY IN THE WORLD : FOUNDED 1909

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams: Flightpres, Sedist, London. Telephone: Waterloo 3333 (60 lines).

COVENTRY: 8-10, CORPORATION ST. Telegrams: Autocar, Coventry. Telephone: Coventry 5210.
BIRMINGHAM, 2: KING EDWARD HOUSE, NEW STREET. Telegrams: Autopress, Birmingham. Telephone: Midland 7191 (7 lines).
MANCHESTER, 3: 260, DEANSGATE. Telegrams: Iliffe, Manchester. Telephone: Blackfriars 4412 (3 lines) Deansgate 3595 (2 lines)
GLASGOW, C.2: 26B, RENFIELD ST. Telegrams: Iliffe Glasgow. Telephone: Central 4857

SUBSCRIPTION RATES: Home: Twelve months, £3 1s. 0d. Six months, £1 10s. 6d. Overseas: Twelve months, £2 18s. 6d
BY AIR: To any country in Europe (except Poland). Twelve months, £5 1s. 0d. Six months, £2 10s. 6d. To Canada and U.S.A. Six months, $16

No. 2093. Vol. LV February 3rd, 1949 Thursdays, One Shilling

The Outlook

Small Mercies

"ALTHOUGH welcoming the new arrangement, the Association hopes, one day, to secure amendments in the Civil Aviation Act to give real freedom to the independent operators, but meanwhile the Association is grateful to the Minister of Civil Aviation for the action which he has taken."

In a communication to the Press, the British Air Charter Association, Ltd., expressed in the very polite words quoted its thanks for small mercies to the Minister of Civil Aviation in connection with his written answer to a question in the House of Lords last week. In view of the fact that the Association is not only at the small mercies of the Minister but entirely at his mercy, such politeness is understandable. We should have expressed it much less politely as "Thank you for nothing."

Among the silly songs which gain evanescent popularity from time to time, there was one some months ago which ran something like this: "I don't want her, you can have her, she's too fat for me." If one substitutes "thin" for "fat," that seems to express precisely the attitude of the Minister and B.E.A. (the Corporation chiefly involved) towards independent operators.

The private charter companies have done excellent work in the past, not only in the more limited sphere delineated for them as "Associates" of the Corporation, but as entirely free agents. Their activities will extend into the military field this year, when they supply aircraft for co-operating with the ground defences during exercises for training radar and anti-aircraft teams. The R.A.F. is so short of aircraft and crews that it cannot supply enough for this purpose, and it would have been a sad outlook if these private firms had not managed to survive in spite of all the obstacles which they have had to overcome. So let us be thankful for our flying barrow boys!

Heads and Tails

HOWEVER, that is by the way. An examination of the conditions under which the Corporation "Associates" will be allowed to operate indicates that the bone thrown to the charter companies has little or no meat on it. The Minister's directive to the Air Transport Advisory Council makes it clear that the private firms will not be allowed to operate any regular route on which B.E.A. has the smallest chance of making a profit. Not only so, but, as the directive states, "maximum fares and freight rates for any service may, if considered expedient, be laid down by the Council." The word "expedient" is much favoured by politicians, and its inclusion in the directive was a foregone conclusion.

A period of two years has been laid down as a normal maximum for the agreements. That is only just about long enough for a company to get established on a route and to work up its traffic. The directive requires these operators to supply such traffic data as may be prescribed, and if it is discovered that a private firm has managed to make a service pay, the Minister can terminate, without notice, any Associate agreement made if it appears to him that "the safety *or other conditions* laid down are not being carried out."

We do not for one moment suggest that Lord Pakenham would take advantage of the clause which we have italicized, but Ministers come and Ministers go, as we have seen, and one day another occupant of the post may not hesitate to make use of this loophole. And no compensation will be paid to the operator when the service ceases.

That Lord Pakenham should adopt the suggestion by Lord Douglas of Kirtleside that applications should, in the first instance, be considered by a body outside the Ministry is natural. That he should have selected the Air Transport Advisory Council is equally natural. The

Council was set up in 1947, and its function was, among other things, to consider questions referred to it by the Minister which required consideration with a view to improvements in air transport services.

The chairman and members of the Council are all admirable men, and one may expect sensible recommendations from them, but the Council is only an advisory body, and the Minister is free, if he so chooses, to disregard its recommendations.

Women's Royal Air Force

WHATEVER may be the dire necessity for the step, the establishment of the Women's Royal Air Force at this particular moment does not appear too well timed. The unrest in the R.A.F. is not likely to be reduced by the introduction of women on an equal footing, with all that entails, except in the matter of pay and allowances, nor is it likely that there will be a rush of women to join the W.R.A.F.

Rates of pay of about three-quarters those of men, which are already found to be inadequate, will scarcely tempt recruits to accept the obligation "to serve in any part of the world, ashore or afloat, and to carry out duty in the air in any type of aircraft." And "other ranks" of the R.A.F. will not welcome having to salute W.R.A.F. officers as an obligation instead of W.A.A.F. officers as a matter of courtesy.

CONTENTS

Outlook	121
Mamba Balliol in the Air	123
Pakistan Party	126
Here and There	127
Civil Aviation News	129
Hawker Fury Trainer	133
Objective Culham	134
Ramjets	137
Radar and the Weather	142
"Able Mable"	144
Gliding in France	144
The Women's Royal Air Force	145
Correspondence	146
Service Aviation	148

Forthcoming Events page 147

Vertical Separation

A STATEMENT in the official report on the collision between a York and a DC-6, which occurred on July 4th last year, has been challenged by the British Air Line Pilots' Association. While accepting the fact that no air operator had complained to the Ministry of Civil Aviation that a vertical separation of 500ft was too small, B.A.L.P.A. points out that the Association had, *in response to a request from the Ministry*, stated the view that a minimum of 1,000ft should be demanded. This was in January, 1947. A second warning was sent to the Ministry in January, 1948.

Deliberate disregard or a faulty filing system?

THE ROYAL AERO CLUB COMMITTEE

FRONT ROW (left to right): Colonel W. C. Devereux, C.B.E., Lt.-Col. Sir Francis K. McClean, A. F. C., Whitney W. Straight, C.B.E., M.C., D.F.C., Lord Brabazon of Tara, M.C., P.C., Sir Frederick Handley Page, C.B.E., S. Kenneth Davies and Major J. Stewart, O.B.E.

CENTRE ROW: Capt. C. F. Uwins, O.B.E., A.F.C., Capt. A. G. Lamplugh, C.B.E., A. O'Connor (House Secretary), Col. R. L. Preston, C.B.E., Major R. H. Mayo, O.B.E., H. W. H. Moore and Eric Greenwood, O.B.E.

BACK ROW: Group Capt. John Cunningham, D.S.O., D.F.C., Wing Cdr. N. H. Woodhead, D.S.C., A.F.C., Frank Woodhead, Capt. Hubert S. Broad, M.B.E., A.F.C., Capt. K. J. G. Bartlett and W. G. Metcalfe.

MAMBA BALLIOL

"In the Air"

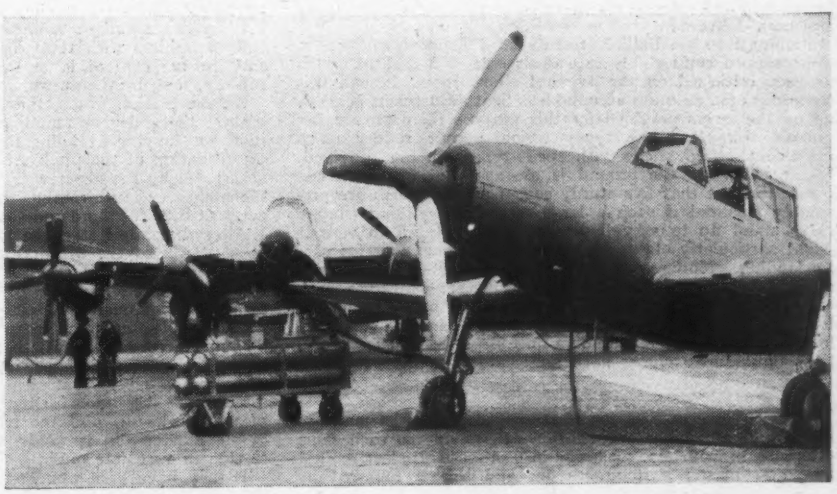
Experience Behind a Small Turboprop : Pitch and Power Control

By WING CDR. MAURICE A. SMITH, D.F.C.

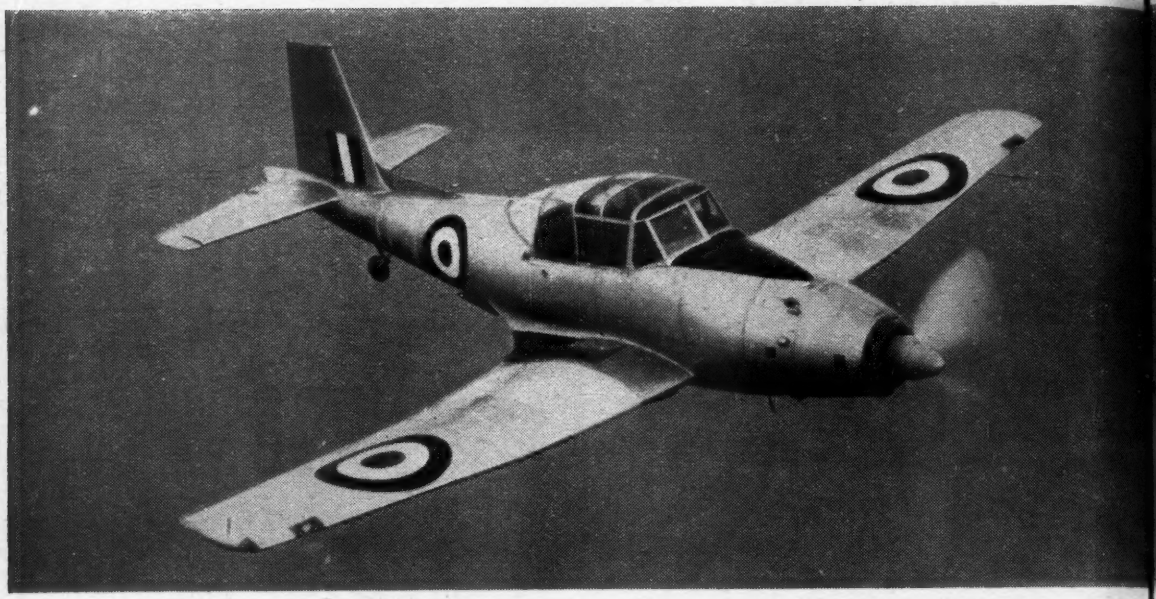
THIS country may have few new fighter prototypes under development, by comparison with America, and may have only the promise of new bombers, but of trainers we now have quite a number. So far as advanced trainers are concerned we have been permitted the luxury of two entirely different types, built to the same specification—the Balliol and Athena, and these two are subdivided into variants with important differences. Moreover, examples of both types are now flying on the power of an Armstrong Siddeley Mamba, one of three small British turboprop designs now well advanced in development and without counterpart abroad. Many months ago it was *Flight's* privilege to handle the Boulton Paul P.108, forerunner of the Balliol basic trainer. This earlier machine is powered with a Bristol Mercury piston engine. Since then a Merlin-powered Balliol 2 and Mamba-powered Balliol 1 have been produced, and we were enabled last week to fly the Mamba-Balliol. The chief purpose was to observe engine and airscrew behaviour.

As might be expected, the Balliol itself has been much improved since the prototype flew, and certain small alterations, in addition to the main difference of power plant, are noticeable in the photographs. The enclosure for the 2-seat cockpit is much superior, and, following fashion, a small dorsal fillet has been added, while the rudder horn balance seems now to be no more than a fairing for a mass balance weight. Ailerons—always pleasant controls on the Balliol—have been further improved by more than doubling the area of their tabs. This has overcome a tendency towards heaviness at the higher speeds at which the later versions fly. The other controls carry trim tabs only. It is reported that the machine is to be dived to something over 450 m.p.h. High-speed and great strength are essential features of advanced trainers, but this figure will be considered excessive by some people. Limitations during the present development period restrict top speed to about 300 m.p.h.

Because the Balliol carried quite a lot of non-standard equipment and is engaged on technical development flying, this description and commentary should not be taken to indicate too precisely what the machine may be like as a "finalized" trainer. For example, the bulk of the pilot's starting operations mentioned will later be included in an



Both Mamba and Python turboprops are undergoing flight trials at Bitteswell airfield. S/L. W. Price-Owen, the chief test pilot, is assisted by S/L. J. B. Starky.



The large two-seat cockpit with power-operated canopy is a dominant feature of the Boulton Paul Balliol I trainer.

Mamba Balliol in the Air . . . . .

automatic cycle energized by a single control. Before describing the flight and analysing the reason for certain of the actions it must be mentioned that a Rotol airscrew is fitted, and that the basic fine-pitch stop, which is the subject of one of the current series of trials, was set at 4 degrees for the particular flight. The stop setting is likely to be fixed at nearer 10 deg.

It may be remembered that on the occasion of Mr. Lindsey's lecture on the development of the Mamba, before the R.Ae.S., the Armstrong Siddeley system of power and pitch control was subjected to some criticism and referred to as "devices." Mr. Lindsey accepted the remarks, but held that it was suitable at this stage and capable of satisfactory operation although open to improvement. Our short experience in the air would lead us to confirm this from the pilot's point of view. To understand something of the airscrew pitch control problems of a turboprop such as the Mamba, reference should again be made to Mr. Lindsey's paper, summarized in *Flight* of December 9th, 1948.

Both the Mamba and its large relation, the Python, are at present started with the aid of gas starters, developed by Armstrong Siddeley and driven from a battery of ground compressed-air bottles. The air line it attached in much the same manner as the plug of a ground starter accumulator. Electric starters will almost certainly be fitted as soon as suitable types have been delivered.

Climbing into the Balliol presents no difficulties, and one is soon strapped comfortably into one's seat in a cockpit which has been criticized on the score of elbow room, though this was in our opinion quite acceptable. Seat adjustment is good, and on the levers provided for this purpose there are smaller controls (bicycle brake type) which permit rudder reach adjustment. Two sticks with spade-type grip are provided. Field of view on the ground is average, but one is forced to face the fact that five sturdy screen pillars, which are presumably essential if such a large screen and sliding canopy are to stand up to very high speeds, cannot fail to restrict vision, particularly obliquely forward where one looks for part of a landing. Moreover, the addition of two-stage amber with its permanently coloured screen top further interferes with view, particularly on turns. One feels that the Balliol is not alone in this weakness. It must be added that the canopy—closed or opened by pressure on a button—operates excellently, closes tight and excludes both noise and draught.

Starting Up

Several of the actions for starting (reference was made to this earlier) are under examination at present, so each must be executed separately. (Chocks in position—All clear.) First the power master switch goes on, and this is followed by fining-off the airscrew pitch to its minimum stop. Paradoxically this is done with the aid of the feathering button after the high-pressure cock has been eased off its stop (explained later). Pitch drops back to the 4 deg stop very quickly and the low-pressure cock (equivalent to the normal fuel cock) is then turned on. Next, to feed fuel exclusively to the two chambers having igniter plugs, the Lucas valve for the purpose is put to "on." At this stage, if not before, the power lever ("throttle") should be checked for closure against its "off" stop—if the throttle is at all open the Mamba will not start. When the ground crew are ready the starting (ignition) cycle is energized and starter air called for. With the noise of a small motor cycle the gas starter accelerates the engine rapidly, and at 1,000 r.p.m. the high-pressure cock is pushed to "on." As the turbine picks up, the Lucas switch is put off and air to the starter motors is stopped.

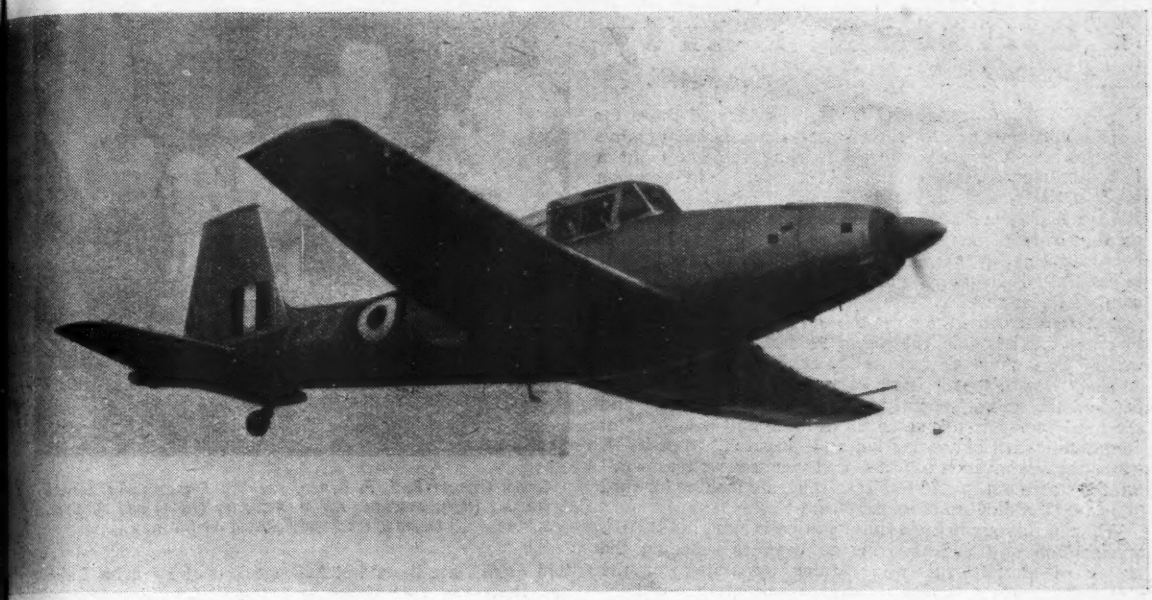
Immediate Readiness

By the time all instruments are checked and ground crew and chocks are clear, the Mamba is ready for taxying. Quick starts and take-offs with gas turbines are limited only by oil temperature, and by power and instrument checks. The engine oil not only lubricates, but operates the airscrew and engine power control device (cam box). Temperature must, therefore, not be too low. In operation, an electric immersion heater would be used to keep oil temperature up prior to starting. Fuel consumption is so high on large units that a lengthy run up might seriously affect range. This is specially true of fighters with their restricted tankage. Pre-heated oil and, in the case of large transports, a tow to the take-off runway, may be the answer to this problem.

On the Balliol, which, like its prototype, has very powerful brakes, the 4 deg minimum pitch setting happens to be just right for taxying at idling r.p.m. The balance to be struck by alteration of the pitch setting is between minimum power absorption by the airscrew in very fine pitch for starting, and the ability, when airborne, to absorb sufficient power in the event of C.S.U. failure and the associated risk of overspeeding.

After the simple standard take-off check for the Balliol has been completed the withdrawable fine-pitch stop is re-selected on the engagement switch. It then comes into play as soon as the pitch exceeds its limit of 18 deg, and remains in engagement until manually withdrawn again. This control of the withdrawable fine-pitch stop will later become automatic, operated according to whether or not there is a load on the landing wheels or, perhaps, interconnected with the flap lever. The Mamba gives insufficient idling power to drive the airscrew at 18 deg pitch, so if the stop were engaged on run-up prior to take-off, and the engine subsequently closed down before moving off, it would simply stall and have to be re-started in very fine pitch.

It may have been wondered how a pilot knows whether he



The neat Mamba installation enhances the appearance of the Balliol 1.

is getting full power from a Mamba or, for that matter, a Python, on opening the single power lever, r.p.m. alone without knowledge of airscrew pitch being no criterion. The answer is that a torquemeter pressure gauge is provided, which looks like a slightly enlarged oil pressure gauge, and reads up to about 600 lb/sq in. The pilot can either memorize the minimum acceptable torquemeter pressure for take-off and the correct pressure for normal cruising power or, if a keen type, provide himself with a small card of curves for reference:

r.p.m. × torquemeter pressure × k = s.h.p.

The constant is fixed for the engine on the test bed. The result is given in s.h.p., ignoring the small amount of jet thrust.

Take-off

On opening up the Balliol moved off under excellent directional control and with an exhilarating push in the back for the occupants. It came unstuck after a very short run and, with wheels and flaps up, climbed away at a creditable rate with a relatively modest recommended climbing speed of 150 m.p.h. Three impressions registered at once on the first experience of flight behind one little Mamba: (1) There was a most pleasing smoothness and freedom from all vibration coupled with a rather unexpected sense of power. (2) The fact that, in spite of its airscrew, the Balliol definitely resembles a pure-jet-powered aircraft more nearly than one with piston engine. (3) That while noise level is pleasantly low—sufficently so to hear the wind scream around the canopy—there is nevertheless an individual power noise as of a rather distant power station. In this noise there is a deeper note for which the secondary reduction gear train may be accountable, in view of the low frequency. This impression was confirmed when taxying after landing. There was no doubt, however, about the quietness and smoothness of the Mamba by comparison with a piston engine.

Having climbed above the mist and haze we closed in on an Oxford from which the accompanying aerial photographs were taken. The Mamba power lever can be harshly handled without ill effect, but, like other gas turbines, this unit takes a second or two to accelerate or decelerate. On opening up from around 12,000 r.p.m. to the full cruising speed of 14,000, a very definite acceleration is felt, there is also a noticeable torque swing to starboard. Formation flying in a Mamba trainer will call for experience for the first reaction to closing or opening the throttle is a momentary reversal of what would be expected, presumably due to pitch change leading that of the turbine speed. The over-and-undershoot are very small indeed, and r.p.m. settle quickly. There seemed to be no need to keep a close watch on jet pipe temperature, which was seldom seen to exceed 520 deg C.

Cruising speed at 3,000 to 5,000ft is as high as 220 m.p.h. I.A.S. on about 700 s.h.p. This is less than Merlin cruising power, but the speed is considerably higher.

We were unable to try any aerobatics on this particular aircraft, although the Mamba-Balliol has been put through its paces in this respect and, incidentally, tested for its 30 seconds of inverted flying. It was apparent within a few minutes of take-off that the Balliol, with its responsive controls, will be well liked on the score of handling in all ordinary manœuvres.

Naturally no attempt was made to try out the feathering of the airscrew. It has been proved, however, in other installations that both the Mamba and the much larger Python readily relight in flight. This is due to their vaporizing-type combustion chambers. The action of the feathering button was mentioned in the starting-up procedure, and to feather an engine in the air the high-pressure cock is first turned off. As a result the airscrew moves automatically to the full coarse position. There is no longer any appreciable drag from the blades, but to prevent slow windmilling the feathering button is next pressed to turn the blades to the fully feathered attitude. As was explained earlier, if the high-pressure cock is part open and the fine-pitch stop withdrawn, the feathering button can be used on the ground to fine off the blade angle prior to starting-up the engine.

Mist started to close in over the airfield as we called up for landing instructions—receiving the answer loud and clear, thanks to the quiet cockpit, and in spite of some outside interference. A comfortable initial approach speed was about 120 m.p.h., and this was reduced safely to 90 m.p.h. during the final stages. Like that of the P.108, the approach angle is steep and the view of the runway over the nose excellent. When holding off, purposely on the fast side, the fine-pitch stop was withdrawn and at once the blades moved round to 4 deg, the effect being similar to that caused by opening powerful air brakes. This was accompanied by a slight nose-down moment, and immediate touch-down at about 75 m.p.h. The withdrawing action was taken late due to the very fine setting of the basic stop for this flight. As explained earlier, with a rather coarser setting, a more convenient time might be early on the approach.

Due partly to an attempt to analyse and explain reactions and reasons for the various control movements, the foregoing account tends to make the Mamba-Balliol appear most complicated to operate. This is not true in practice, and, in fact, in most respects, once airborne, the machine and its power unit are unusually simple to handle.

Merlin-engined Balliol 2 and Athena 2 trainers are now undergoing comparative trials at Boscombe, and, no doubt, fairly prolonged pre-service trials will follow for one or both. The turboprop Balliol 1, which may follow the piston-engined variant into service, will by then have a great deal more experience behind it. Apart from its primary purpose, the Balliol will also give the Services and engine manufacturers invaluable experience in the operation and maintenance of small turboprops.

Pakistan Party

A.V.-M. Atcherley Chief of R.P.A.F.

THE Air Minister, the Under-Secretary of State for Air, officers of the three Services, and familiar figures from the industry were among the guests at a Pakistan House reception last Thursday. The occasion marked the departure, on the following day, of A.V.-M. R.L.R. Atcherley, C.B.E., A.F.C., to take up his appointment as Chief of the Royal Pakistan Air Force, and further enabled the guests to meet A. Cdre. M. K. Janjua, at present in the United Kingdom on a special mission for the Government of Pakistan.

A statement from the office of the High Commissioner for Pakistan recalled that the Royal Pakistan Air Force came into being at the same time as the Dominion of Pakistan—on August 14th, 1947. In seventeen months, the Dominion has laid the foundations of its Air Force organization, and the need to-day is to pursue its training and development programme with determination and despatch. "A.V.-M. Atcherley's reputation for drive and vigour is well known," ran the statement, "and Pakistan is keenly looking forward to a rapid building-up of its Air Force."

While in this country, A. Cdre. Janjua is studying R.A.F. organization and endeavouring to keep to schedule the supply of aircraft and raid-warning apparatus for the R.P.A.F. Some difficulty is being experienced in obtaining the desired quantity of warning gear. The Air Commodore is also "going into the question of securing the services of specialist personnel" for the R.P.A.F., particularly those qualified to train the "Pakistani Young Entry" in technical maintenance.

A. Cdre. Janjua was commissioned in the Indian Army in 1934 and seconded to the Royal Indian Air Force four years later. At the time of the partition of the Indo-Pakistan sub-continent in 1947, as a Wing Commander, he was appointed Senior Member for Pakistan on the Air Force Sub-Committee of the Armed Forces Reconstitution Committee. With the rank of Group Captain, in August, 1947, he became Senior Officer I/C, Administration, R.P.A.F., in which appointment he was later promoted to Air Commodore. For a period, he was acting Air Commander, R.P.A.F.

The principal bases of the R.P.A.F., the Air Commodore told *Flight*, are the old R.A.F. stations at Karachi, Lahore and Peshawar. At Mauripur is the R.P.A.F. College, run on Cranwell lines. Equipment of the Air Force includes Hawker Tempest 2s, Hawker Furies, Dakotas and two Bristol Freighters.

Group Captain R. J. F. Barton, Resident Director, Air Service Training (left), welcomes A.V-M. Atcherley (right) and A. Cdre. Janjua of the Royal Pakistan Air Force.

Prior to his departure, A.V.-M. Atcherley, accompanied by A. Cdre. Janjua and S/L. A. R. K. Malik, Controller of Air Stores, R.P.A.F., paid a visit to Air Service Training, Hamble, with the object of meeting Pakistani officers taking the two-year Technical Officers' Course. After inspecting the R.P.A.F. personnel, the party toured the various schools with G/C. R. J. F. Barton, O.B.E., Resident Director.

An interesting aspect of the visit was the meeting between the Resident Director and A.V.-M. Atcherley, for the latter had been a cadet under Group Captain Barton, then Deputy Commandant at the R.A.F. College. Prior to his Pakistan appointment, A.V.-M. Atcherley was himself Commandant at Cranwell.

TEST PILOTS HONOURED BY ROYAL AERO CLUB

FOR his achievement in establishing the world's altitude record for Great Britain, by flying the D.H. Ghost-Vampire to 59,446 ft, on March 23rd last year, Mr. John Cunningham, D.S.O., D.F.C., receives from the Committee of the Royal Aero Club the award of the Britannia Trophy for 1948. The Trophy was presented to the Royal Aero Club in 1913 by Mr. Horatio Barber, holder of Aviator's Certificate No. 30 and designer and constructor of the Valkyrie tail-first monoplane and the Viking biplane of 1910. It is awarded annually to the British aviator considered to have accomplished the most meritorious performance in the air during the preceding year. The 1947 Trophy was shared by S/L. H. B. Martin and S/L. E. B. Sismore for their London-Capetown record flight in a Mosquito P.R.34.

Mr. John Douglas Derry, D.F.C., as the first British subject to exceed the speed of sound in a British aircraft, receives a Royal Aero Club Gold Medal. While diving the D.H.108 over Windsor on September 6th last year, Mr. Derry recorded a Mach Number in excess of one. Only 24 Gold Medals have been awarded by the Club since its foundation in 1901.

For revictualling the keepers of the Wolf Rock lighthouse from the air, in a Westland Sikorsky S-51 helicopter on February 7th, 1948, Mr. Alan Edgar Bristow has been awarded a Royal Aero Club Silver Medal.

Mr. John Cunningham, D.S.O., D.F.C. (chief D.H. test pilot).

FIRST CHILEAN-BUILT AIRCRAFT

PRODUCED by the Central Workshops of the Chilean Air Force, the Maertranza Central de Aviacion, at Santiago, the Triciclo-Experimental two-seater low-wing monoplane is indicative of the interest being taken by the smaller Republics of South America in the possibilities of building aircraft from locally produced materials. The Triciclo-Experimental has been constructed from native woods bonded by casein glue of local manufacture and its engine is the only imported item. Senor Alfredo D. Ferrer is the designer of this aircraft, which has a fixed tricycle undercarriage, twin fins and rudders, and is powered by a Franklin four-cylinder horizontally-opposed air-cooled engine which develops 95 h.p. at 2,450 r.p.m. Complete dual controls are fitted in the side-by-side cabin, and radio equipment of Chilean design is fitted.

The experimental two-seater, with tricycle undercarriage, designed and built by the Chilean Air Force.

HERE AND THERE

Heaviest Bomb Load

A B-36 of the U.S.A.F. recently took off from Carswell Base, Texas, with a bomb load comprising two guided missiles without warheads, weighing 37½ tons, presumably short tons. The aircraft carried this load 2,900 miles, dropped the missiles on the bombing range at Muroc, California, and returned to Carswell, averaging about 250 m.p.h. for the flight. The main starboard undercarriage collapsed when landing and the aircraft was damaged. Both guided missiles were carried within the bomb bays of the B-36.

Cambridge V.R. Dance

VOLUNTEER Reservists from quite a number of other schools rallied to the Cambridge V.R. Social Club's second annual dance at the Dorothy Café on January 21st. The affair was thoroughly well organized and it was refreshing to see a sprinkling of R.A.F. mess kit; everyone who attended must be looking forward to the event next year. Guests included Mr. A. G. G. Marshall, managing director of Marshall's Flying Schools, who was made an O.B.E. in the New Year's Honours, S/L. L. V. Worsdell and S/L. W. R. Sloane.

New Avro Bomber

MR. T. O. M. SOPWITH, chairman of the Hawker Siddeley Group, stated at the company's thirteenth annual general meeting that Avros had a new bomber in the design and experimental stage. Both the Hawker and Gloster companies had new and advanced fighters under development, and a production order had already been received for jet aircraft for the Royal Navy. Orders had also been placed for the Armstrong Siddeley Python turboprop, and a Government contract for additional turbine research, including work on turbojets, had been offered. A. V. Roe, Canada Ltd., continued to make progress, said Mr. Sopwith, with work proceeding on the twin-jet fighter for the R.C.A.F., and the C-102 jet transport for Trans-Canada Airlines. A new turbojet, the Orenda, was due to run during January.

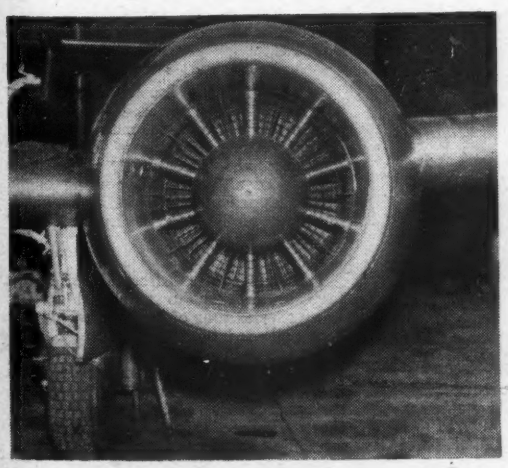
TWO ACES: A Chrislea Super Ace was recently demonstrated to the de Havilland Aircraft Company at Hatfield by Mr. D. Lowry, sales manager of the Chrislea Aircraft Company. Mr. John Derry flew the machine and is seen here at the controls with Mr. Peter de Havilland and W/C. C. A. Pike, (obscured by reflection) in the rear seat. The Chrislea Ace has a D.H. Gipsy 10 engine.

R.C.A.C. WINGS

Royal Canadian Air Cadets who have successfully completed pilot training under the R.C.A.F. flying scholarship scheme in 1949 are permitted to wear the new wings badge illustrated above. First presentations will probably be made next April.

P.o.W. Memorial

TO perpetuate the memory of those who died in Japanese prison camps during the war, the Allied Prisoners of War Memorial Church Fund has been launched. Through the initiative of the organizer, the Rev. M. Cowin, Ex. R.C. Chaplain to H.M. Forces, who was himself a prisoner in Japanese hands for three and a half years, the groundwork has been well prepared to build a church to their memory. The estimated cost is £15,000 of which £4,000 has already been subscribed. To expedite the erection of this church, the situation of which is to be at Wymondham, in Norfolk, funds are urgently needed. Those who wish to assist the establishment of this memorial are invited to send donations to the Rev. M. Cowin, the Presbytery, Wymondham, Norfolk; cheques should be crossed "Memorial Account."



WITHOUT FLAW: The exceptional climb performance of the Beryl-Meteor may be attributed in no small part to the efficiency of its immaculate engine air intakes. The pair of Metrovick Beryls can together produce 7,700 lb of static thrust.

1949 Brancker Lecture

MAJOR R. H. MAYO, O.B.E., M.A., A.M.Inst.C.E., F.R.Ae.S., M.Inst.T., F.I.A.S., will give the 1949 Brancker Memorial Lecture at the Jarvis Hall (R.I.B.A.), 66, Portland Place, London, W.1, at 5.30 p.m. on February 14th. Major Mayo's subject will be "Oil The Record: the Influence of Records on Air Transport." Major Mayo is President of the Commission Sportive of the F.A.I. and Chairman of the Records, Racing and Competitions Committee of the Royal Aero Club. Visitors are invited to this lecture which will be free and without tickets.

Helicopter Association First President

THE Council of the Helicopter Association of Great Britain has elected Mr. J. G. Weir, C.M.G., C.B.E., F.R.Ae.S., to the office of first President of the Association. Realizing the possibilities of rotary wing flight, Mr. Weir was instrumental in establishing the late Juan de la Cierva in Great Britain in 1925. In the following year the Cierva Autogiro Company was formed of which Mr. Weir has been chairman since its inception. Mr. Weir's acceptance of the office of president, and his enthusiasm for rotating wing aircraft will do much to further the objects for which the Association was formed.

Transport Institute Scholarship

TO commemorate its 25th anniversary the Council of the Institute of Transport founded in 1944 its Silver Jubilee Scholarships. Applications are invited from members of the Institute for the award of the 1949 Scholarship, the value of which is up to £150. The purpose of the Scholarship is to assist the selected member to meet expenses to be incurred in travel for the purpose of studying transport, or specific projects of transport research, or full-time education at a University or other institution approved by the Council. The member awarded the Silver Jubilee Scholarship also qualifies for the F.C. Coleman Modern Transport Award founded in 1944 in memory of the late Mr. F. C. Coleman's past efforts for transport education and the part he played in the founding of the Institute. The amount of

HERE AND THERE

this award is £50 per annum to assist in the purchase of books and equipment for the pursuit of the winner's studies. Applications must be made to the Institute at 80, Portland Place, London, W.1, from whom further details may be obtained, not later than May 31st.

Improvising Air Tankers

TO meet the need for rapid provision of aircraft for the Berlin Airlift capable of carrying large quantities of fuel oil, Airtech, Ltd., of Thame Airport, Bucks, in co-operation with the Regent Oil Co. who supplied large lorry tanks, are fitting the tanks to Haltons of British American Air Services, an associate company of Airtech. The first of these aircraft is now in service on the Berlin airlift and similarly equipped aircraft belonging to Westminster Airways are nearing completion. The tank capacity available in each aircraft is 1,800 gallons.

Hunting's Canadian Manager

HUNTING Aviation Group has announced the appointment of Mr. G. R. Wooll as general manager of Weston Aircraft, Ltd. (Canada), a Hunting associate company engaged in aircraft repair and maintenance at Oshawa municipal airport. Mr. Wooll, formerly chief survey pilot of Kenting Aviation, Ltd., will also act as manager of Kenting's Oshawa base. Mr. Wooll served in the R.A.F. during the war, part of which he spent as a test pilot on loan to de Havillands. After a brief post-war period of service with the R.C.A.F. he joined the Photographic Survey Co., principal Canadian company of the Hunting group, and in 1946 transferred to Kenting Aviation when it was formed as the group's aircraft operating company for Canada.

Mr. G. R. Wooll.

FLAPLESS WONDER: A Chance Vought XF7U-1 Cutlass fighter (two Westinghouse axial-flow turbojets with afterburners) touches down at the U. S. Navy's Hensley base. No trailing-edge flaps are fitted on this most unorthodox of carrier-borne fighters, but the leading-edge is of "droop-snoot" design, as on the Grumman Panther.

News in Brief

AT an extraordinary general meeting of S. Instone & Co., Ltd., held recently in London, resolutions for a reduction of capital were carried by an overwhelming majority.

* * *

Rotary Wings, Inc., of Jensen Field, Sacramento, California, has been appointed a distributor for the Hiller 360 helicopter in the principal agricultural and industrial areas of northern California and northern Nevada.

* * *

Mr. H. R. Bunn has resigned his appointment of public relations officer with Air Service Training, Ltd., to commence business on his own account. His place was taken by Commander Stokes, R.N., on February 1st.

* * *

Among the artistes who have promised to entertain at the Ball on February 11th at the Savoy, organized by the Guild of Air Pilots and Air Navigators and the Air League of the British Empire, are, Eric Barker, Pearl Hackney, Charlie Chester and Sylvia Robin.

Two Lincolns and two Dakotas are to be provided by the R.A.A.F. for forest fire patrol work in co-operation with the Victoria Forestry Commission in Australia. By radio communications all relevant information on forest fires can be relayed to forestry officials to assist them in dealing with outbreaks.

* * *

The New Zealand Government has purchased a second de Havilland Devon to be added to the Parliamentary Communications flight. It will be used by distinguished visitors to New Zealand and by Cabinet Ministers.

* * * *

Mr. E. R. Abello, director of the Argentine agents for the Hymatic Engineering Company, Briten S.R.L. of Buenos Ayres, has returned to the Argentine after a visit to England. His visit included discussions with the Hymatic Company on their present and projected range of products and their prospects in the Argentine.

* * *

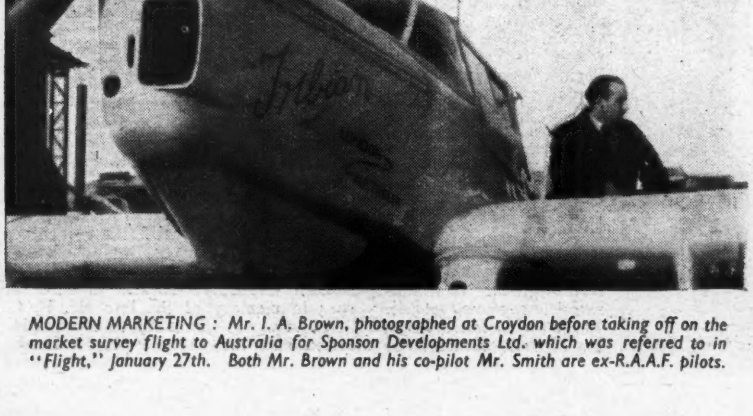
Export manager of a London radio manufacturer, Mr. Harold Field, has flown over 150,000 miles with B.O.A.C. during the last three years on his work of promoting British exports. Another export manager, Mr. P. Gayer, has flown over 75,000 miles for the same purpose in the past 18 months, also with B.O.A.C.

* * *

In place of the Crosley Cobra engine which originally powered the American light aircraft, the M-18, manufactured by Mooney Aircraft, Inc., of Kansas, this company has successfully investigated the use of a 65 h.p. Lycoming engine. C.A.A. approval is now being sought for the new model, to be known as the M-18L.

* * *

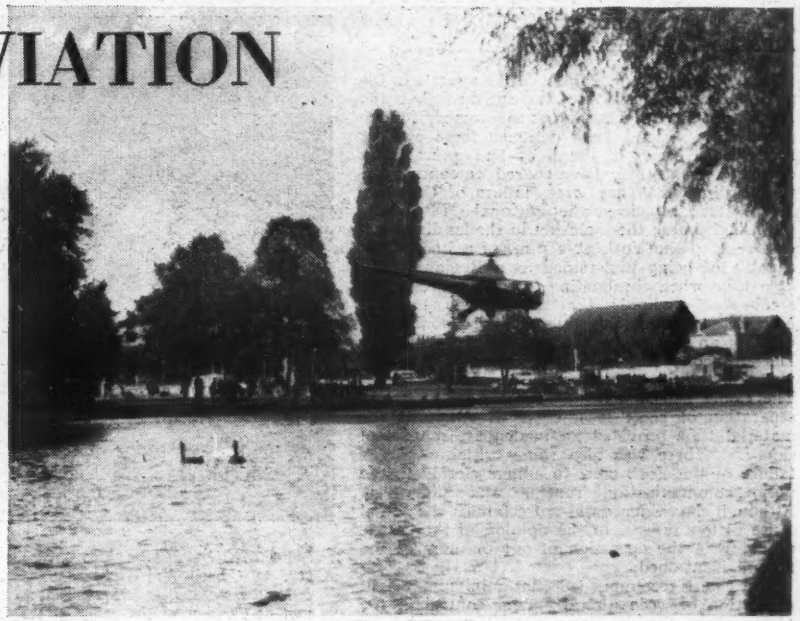
The Lancashire Aircraft Corporation have undertaken to transport to Germany several tons of clothing which have been collected by the people of Sheffield in response to an appeal by the Bishop of Sheffield. The clothing is being flown free of charge in the available space of the company's Halton tankers when these aircraft rejoin the Airlift after servicing in this country.



MODERN MARKETING: Mr. I. A. Brown, photographed at Croydon before taking off on the market survey flight to Australia for Sponson Developments Ltd. which was referred to in "Flight," January 27th. Both Mr. Brown and his co-pilot Mr. Smith are ex-R.A.A.F. pilots.

CIVIL AVIATION NEWS

Charter Companies on Schedules: Exports and Imports: New Flying-boat Service



SIGHT-SEEING: A Westland-Sikorsky 51 hovering near the Shakespeare Memorial Theatre. The first all-British model is nearly completed and B.E.A. may accept several with Alvis Leonides engines for flight trials.

ASSOCIATE AGREEMENTS

THE Minister of Civil Aviation has announced arrangements for permitting charter companies to operate scheduled services as associates of the British Airways Corporations. It will be remembered that some arrangements were made in 1948 for a few charter companies to fly scheduled services on certain routes which had been abandoned by B.E.A. as uneconomical. Approval was given for 21 routes, but for one reason or another only 10 were operated. Inclusive tours were organized by the charter companies on 13 routes.

On July 21st last year Lord Pakenham announced that Lord Douglas had been invited to investigate those sections of the Civil Aviation Act which enabled the Corporations to appoint associates and agents, with particular reference to the arrangements which had already been agreed. Lord Douglas was unable to see any need at present to amend the relevant sections of the Act, and suggested that until B.E.A. were in a position to provide all the scheduled services in this country for which there was a justifiable demand, charter companies should, under certain conditions, continue to be allowed to operate certain classes of scheduled services as associates of the Corporations. He further recommended that applications should be considered in the first instance by a body outside the Ministry and that the Air Transport Advisory Council might conveniently undertake the task.

After careful consideration the Minister has decided that although B.E.A. were steadily expanding services it would place an unjustifiable burden on them, and on the taxpayer, if they took over all routes at the present time. At the same time he did not wish to deny the public the benefit of such facilities as the charter companies were prepared to offer. He has pointed out that the other two Corporations were barely affected. The Air Transport Advisory Council, under the chairmanship of Lord Terrington, has agreed to undertake the responsibility of acting in an advisory capacity in connection with applications, but the ultimate responsibility for approving associate agreements would rest with the Minister.

In considering applications it will be necessary to take into account the cost of supplying ground and navigational facilities if not already available, and the Council will avoid recommendations which would involve new expenditure in that direction. Maximum fares and freight rates for any services can, if considered expedient, be laid down by the Council. Agreements would not normally exceed two years, owing to the frequently changing circumstances in aviation. Operators will be required to observe those safety standards with which the Corporations are required by the Minister to comply, and to make monthly returns showing the types and registration marks of aircraft employed, and traffic data as may be prescribed. Associate companies are also required to observe terms and conditions of employment not less favourable than those observed by the Corporations, a condition which will present some difficulty, particularly with regard to pensions.

The Minister wishes it to be understood that the British Corporations intend eventually to operate all British scheduled services and that his action shall not be regarded as an indication of any departure from the Civil Aviation Act of 1946. The charter companies would be unwise, therefore, to be encouraged in considering this as a thin end of the wedge to their benefit, certainly whilst the present Civil Aviation Act is in force.

Charter companies are at a slight disadvantage in being unaware of the intentions of the Corporations on certain routes. It is possible, however, that those routes which will be opened within, say the next two years, will be announced so that investigations of potential traffic on other routes may be made. Lord Pakenham has envisaged arrangements, mostly in respect of ferry and cross-country services, although applications may be made for main trunk routes, interpreted as those radiating from London, and approval will depend on the Corporations' plans, the competition with other forms of nationalized transport, and the public necessity. In such cases the Corporations would be consulted but would not have veto privilege. In all cases the Minister will make the final decision. Applications to undertake such services must be made to the Air Transport Advisory Council, 9, Buckingham Gate, London, S.W.1.

YORK AND DC-6 COLLISION REPORT

BY order of the Minister of Civil Aviation a Court was held to investigate the accident which occurred on July 4th, 1948, to the Swedish aircraft SE-BDA which collided with the R.A.F. Transport Command York aircraft (MOYAU-RAFAIR 248) over Northolt. The circumstances of the accident, the conclusions of the Court and some recommendations are included in H.M.S.O. Publication Cmd. 7609. The Swedish aircraft entered the Metropolitan Control Zone over Luton beacon flying in cloud at 5,000ft at about 2.19 p.m. At 2.48 p.m. she was cleared down to 2,500ft and at 2.59 p.m. informed the authorities that owing to weather conditions she would proceed to Amsterdam. At 3 p.m. a message was sent to her over Northolt by R/T that she was cleared out of the zone via Stapleford at 2,500ft but this message does not appear to have reached her.

The York entered the Control Zone at 2.32 p.m. at Woodley Beacon flying at 5,000 ft and on arrival over Northolt was told to remain at 5,000ft. At 2.54 she was cleared to descend to 3,000ft and instructed to call at that height. At 2.56 p.m. Northolt acknowledged the last message received from the York which was "Roger 3,000ft." This may have been either an intimation from the York that she had reached 3,000ft or merely an acknowledgment of Northolt's message. Shortly after 3 p.m. the two aircraft collided about 4¼ miles N.N.W. from the centre of the airfield. There were no survivors.

The Court concluded that the cause of the loss was in all probability to be found in the field of human fallibility on the part of those responsible for the control of the aircraft

Civil Aviation News . . . . .

from the ground, or the flight of the aircraft in the air. Although the Court was satisfied that the Air Traffic Control system was satisfactory for the purpose for which it was designed there were at least three errors of detail or bad practice in operation which may have caused or contributed to the disaster. They were, failure of Uxbridge A.T.C.C. to broadcast the Regional QFF at the published times; the inclusion in the landing forecast sent to the York at 2 p.m. of a Local QFF capable of being understood as a Regional QFF at a time when the landing forecast was not immediately required; the transmission by the Northolt Approach Controller to the Swedish aircraft of an erroneous Regional QFF. Owing to the erroneous Regional QFF the DC-6 altimeter was probably in error by 1 millibar or about 28ft. The Court considered that the minimum height separation of 500ft in force at Northolt at the material time provided an inadequate margin of safety. There was also some criticism of the failure of the York crew to adhere closely to the radio communication routine and procedure. Although the evidence did not establish the actual cause of loss it was, in the opinion of the Court, probably in the operation of one or more of the factors mentioned.

The Court recommended that minimum height separation between aircraft under control in the Metropolitan Control Zone in IFR conditions be increased to 1,000ft and also that steps should be taken to ensure that certain routines were strictly adhered to in matters of Control and broadcasts. It was recommended that Air Traffic Controllers should be put through periodical test checks and their records, whether monitored or recorded, be periodically examined with a view to detecting errors and the development of bad practice.

EMIGRATION SPECIAL: This Dakota is one of two supplied by W. S. Shackleton Ltd. to Guinea Air Traders Ltd., Sydney, Australia. Scottish Aviation Ltd. converted the seating arrangement to four rows of 7 seats with one additional seat at the rear of the cabin on the starboard side. Full loads of 29 Italian emigrants are being flown from Rome to Sydney.

DECEMBER EXPORTS AND IMPORTS

	QUANTITIES			VALUE	
	Dec 1948	Jan-Dec 1938	Jan-Dec 1948	Dec 1948	Jan-Dec 1948
				£	£
IMPORTS					
Complete aircraft—number	6	30	67	131,500	2,361,922
Aircraft parts—value ...	—	—	—	394,406	3,233,119
EXPORTS					
Complete aircraft—number					
To Eire	—	—	7	—	7,200
Union of South Africa	1	36	64	9,350	541,744
Southern Rhodesia ...	—	*	10	—	170,008
India, Pakistan, etc.. ...	31	12	76	162,626	935,450
New Zealand	—	48	30	—	354,509
Canada	—	—	97	—	1,312,016
Other British Countries	4	91	64	60,520	632,318
Sweden	15	24	31	125,200	235,858
Norway	4	*	23	95,600	366,314
Denmark	—	*	32	—	67,150
Belgium	30	17	117	177,466	550,593
France	1	32	68	48,868	675,178
Switzerland	1	*	7	5,500	10,831
Portugal	3	34	20	2,772	145,742
Greece	3	*	32	10,950	216,850
Turkey	—	15	75	—	425,550
Argentine Republic ...	10	*	127	153,036	4,082,137
Other Foreign Countries	22	197	215	398,455	2,696,316
Total	125	506	1,095	1,250,343	13,425,764
Aircraft engines—number					
To Eire	—	*	50	—	161,882
India, Pakistan, etc. ...	12	51	95	32,457	287,938
Australia	1	42	56	1,971	116,186
Canada	—	146	111	—	520 642
Other British Countries	33	114	198	75 522	470,709
Sweden	2	*	11	475	103,832
Spain	—	—	10	—	32,158
Italy	5	*	65	6,449	117,783
Turkey	—	*	7	—	12,332
United States of America	—	*	1	—	6,147
Argentine Republic ...	31	—	278	98,983	624,099
Other Foreign Countries	46	509	463	81,774	753,816
Total	130	862	1,345	298,631	3,207,524

* Included in "Other British Countries" or "Other Foreign Countries" in 1938.

SHORT RANGE JET SERVICES

IN a lecture, "London to Paris by Jet Plane," to the Aero Club de France in Paris on January 20th, Sir Frank Whittle showed that the operation of jet aircraft between the two capitals was worth while. Although it was not necessarily of great advantage over short distances for passengers to fly at high speed, it was a more economic proposition for the operators. In reference to stacking problems he said that he was very much more optimistic as a result of his recent visit to the U.S.A. where great improvements had recently been made in preventing traffic congestion. For short-range flights it should be possible, he said, to arrange that clearance for take-off was not given unless and until a guarantee was given that the aircraft could land without delay. The London-Paris route was selected primarily because it is the one on which it is particularly difficult to make a profit, and Sir Frank believes that the jet engine could improve the prospects. A summary of the paper will be given in next week's issue of *Flight*.

FLYING-BOATS TO DAR ES SALAAM

B.O.A.C. is attempting to replace the York service from London to Dar Es Salaam, which flies twice a week, with a Solent flying-boat service from Southampton to the same destination. The flying-boat route would be via Augusta, Alexandria, Khartoum and, it is hoped, Lake Naivasha, to Dar Es Salaam. There are, however, several problems to be solved before this lake can be used, but every effort is being made since it would provide a near-by flying-boat alighting place for Nairobi. If Lake Naivasha is found to be impossible there would appear to be no alternative but to use Port Bell, which is already a night stop on the South African service. There are already four Yorks flying each week between London and Nairobi. The first proving flight on the projected service landed at Dar Es Salaam on January 24th.

GEMINI ACCIDENT AT CROYDON

IN the official report of the Chief Inspector of Accidents on the crash of a Miles Gemini after taking off from Croydon on February 27th, 1948, the opinion is stated that the main cause of the accident was the overloaded condition of the aircraft. Contributory factors were, it is stated, unfavourable conditions of wind, airfield surface and rising terrain. The report places the responsibility for the accident upon the pilot. One person, the co-pilot, was killed and the other three occupants of the aircraft were injured, two of them seriously.

After taking off from Croydon for a flight to Milan, the Gemini failed to gain sufficient height to clear some trees on the higher ground south-west of the airfield. No defect of engines or airframe could be found to account for this failure

to climb and the report observes that the machine was overloaded by 384lb, equivalent to nearly 13 per cent of its maximum permissible all-up weight. Also there were patches of snow on the grass surface of the runway and an E.S.E. to E. wind at about 7 m.p.h. gave a slight tail-wind component. These factors would have an adverse effect on both take-off and climb. Since the take-off was made in the direction of rising ground, the climb would have had to be to a height of 150 feet in order to clear the trees beyond the airfield boundary.

I.A.T.A. CLEARING HOUSE TRANSACTIONS

INTERNATIONAL air traffic transactions put through the International Air Transport Association Clearing House, London, during November last year totalled $13,442,000. This amount is virtually the same as that for the preceding month but is almost double the turnover recorded in November, 1947. As a result of the Clearing House off-setting credit and debit balances, the 30 member airlines concerned were able to settle their November transactions by cash payment of only $1,558,000. A saving was thus made in transfer charges, exchange premiums and interest on 76.8 per cent of the total. During the first eleven months of 1947, Clearing House transactions totalled $46,000,000 and the off-setting amount was 62 per cent, and in the corresponding eleven months of 1948 the transactions totalled $111,000,000 of which 77 per cent was settled by off-setting balances.

AIR FRANCE BOOKING AGREEMENT

A THROUGH booking agreement has been signed by Air France and Colonial Airlines so that passengers from Montreal to Paris will be able to travel at the same fare as passengers from New York to Paris. An aircraft from Montreal links at New York with the mid-day flight to Paris and the journey takes less than 24 hours. Colonial Airlines operate services between Montreal, Ottawa and Bermuda, and 18 important centres in the U.S. The company have moved their Cairo offices from Shepherds Hotel to new and larger premises at the corner of rue Kars-el-Nils and rue Soliman-Pacha. The official opening of the new offices took place on January 10th. There are now four Air France services a week between Cairo and Paris and two long-distance services each week between Paris and Saigon, stopping at Cairo.

AIRPORT TRAFFIC IN DECEMBER

MINISTRY OF CIVIL AVIATION figures for December, 1948, show that during the month Northolt handled not only the greatest number of aircraft but also more passengers than any other airport in the U.K. London Airport handled about 455 tons of mail and 700 tons of freight during December this year compared with 380 tons of mail and 560 tons of freight in December, 1947. Scheduled aircraft movements at London Airport during 1948 totalled 25,535 and at Northolt 29,256, an increase over 1947 when figures were 17,962 and 21,130 respectively. London Airport handled 385,673 passengers on scheduled air services during the year, an increase of more than 100,000 over the 1947 figure and Northolt handled 320,520 scheduled passengers in 1947 and 445,616 in 1948. G.C.A. assisted landings at London Airport during 1948 totalled 2,351, a ratio of 1 in 5.27. During November the ratio was 1 in 2.99 due to fog. Since the M.C.A. took over the equipment on July 1st, 1947, 3,569 landings have been made with the help of G.C.A. The equipment became available on a 24-hour watch basis at London Airport on July 19th, 1948.

	All Aircraft Movements		Scheduled Movements		Scheduled Passengers	
	Arr.	Dep.	Arr.	Dep.	Arr.	Dep.
Aberdeen (Dyce)	401	398	—	—	—	—
Belfast (Nutts Corner) ...	—	—	175	175	2,039	2,726
Birmingham (Elmdon) ...	237	236	—	—	—	—
Blackbushe	268	272	—	—	—	—
Bovingdon	413	406	—	—	—	—
Bristol (Whitchurch) ...	263	263	—	—	—	—
Cardiff (Pengam Moors) ...	—	—	39	39	130	118
Croydon	319	315	—	—	—	—
Edinburgh (Turnhouse) ...	249	257	—	—	—	—
Isle of Man (Ronaldsway) ...	—	—	87	87	755	778
Kirkwall (Hatston) ...	306	307	—	—	—	—
Liverpool (Speke)	283	283	164	168	1,686	2,086
London Airport	1,145	1,132	762	796	10,315	12,889
Manchester (Ringway) ...	435	423	145	147	1,090	1,315
Northolt	1,319	1,307	1,040	1,060	11,846	15,294
Prestwick	393	401	246	247	895	1,020
Renfrew	347	347	278	285	2,894	2,824
Southampton (Eastleigh) ...	597	609	107	108	787	675
Southampton Water ...	—	—	41	38	527	817
Weston-super-Mare ...	253	256	—	—	—	—
Yeadon	247	247	—	—	—	—

BREVITIES

BRITISH COMMONWEALTH PACIFIC AIRLINES are introducing Douglas DC-6 aircraft on the "Southern Cross" route from Auckland to Vancouver, via Fiji, Canton Island, Honolulu and San Francisco, on February 16th. The flying time is 31½ hours.

* * *

The Brazilian aircraft firm, Companhia Aeronautica Paulista, is reported to have been closed down recently owing to heavy financial losses. Of the 1,500 civil aircraft registered and operated in Brazil, about 1,000 are said to have been manufactured by the Company.

* * *

Lord Pakenham told the Liverpool group of Labour M.P.s on January 26th that the correct trade union procedure had been adopted in the case of the transfer of the B.E.A. Maintenance Base from Speke to Renfrew. He revealed also that full investigation had been made before agreement was reached between the management and trade union sides of the National Joint Council for Civil Aviation.

* * *

Two Bristol New Type 170 Freighters operated by the Spanish airline, Aviacion y Commercio, have completed a number of flights between Barcelona and Bovingdon carrying fruit. The aircraft stop at Bordeaux for refuelling. The Company owns six Freighters and a third aircraft is expected shortly to join the fruit run which may continue through the winter.

* * *

According to a recent survey of airline mileage by the U.S. Civil Aeronautics Board, the Russian airline Aeroflot is one of the three biggest airlines in the world. The report states that Aeroflot flew a total of 1,327,476 miles a week on regular

FOR AIR FRANCE: Taxying tests are continuing with the S.E. 2010 at Toulouse-Blagnac at an all-up weight of 52 tons. This is the prototype of a series to be flown by Air France on Trans-Atlantic services. 84 passengers will be accommodated by day and 78 by night in berths. Estimated speed is 272 m.p.h. at 20,000ft.

Civil Aviation News . . . . .

services, mostly inside Russia. T.W.A. flew 1,421,477 miles a week on regular services and P.A.W.A. mileage for 1948, estimated from fares and cargo charges amounting to more than £32,000,000, was considered to be the largest in the world. United States airlines flew 8,976,000 miles a week during 1948, 6,946,000 on regular internal services and 2,030,000 miles on regular overseas services.

* * *

Sabena is now operating into Melsbroeck, the new airport near Brussels, which is already used by B.E.A. and American companies for scheduled services. The new airport at present has two runways of 2,200 yards and 2,000 yards long, but when completed the airport will cover 2,200 acres and have six runways ranging in length from one to three miles. Modern equipment permits landings and take-off every two minutes.

* * *

The Air Registration Board has issued *Notice to Licensed Aircraft Engineers and to Owners of Civil Aircraft*, No. 30, issue 2, introducing inspection for the blade-retaining nuts and barrels of airscrews fitted to Viking aircraft. Although no cases of failure have been reported on Wayfarer airscrews, visual inspection of the barrel arms should be made if undesirable vibration occurs.

* * *

Indian Overseas Airlines have applied to the Government of Australia for permission to operate a weekly service from Calcutta to Sydney, with stops at Bangkok, Singapore, Batavia, Surabaya, and Darwin. If permission is granted, the proving flights will be made in February and the scheduled service will start in March. Qantas Empire Airways already operate a service from Australia to India.

* * *

In the first five months' service with Air Transport (Paris) four Bristol New Type 170 aircraft completed 2,400 flying hours and flew more than 350,000 miles, carrying 3,400 passengers and 920 tons of freight. The aircraft are mainly used for freight carrying between France and North Africa, but a twice-weekly service is operated between France and Haifa, carrying passengers on the outward trip and returning with mail and small freight in addition to the passenger load. The round trip takes about 32 flying hours.

* * *

Pilots are reminded in Notice to Airmen No. 472 that after making an instrument approach to an airfield they must continue to fly under IFR until they are 500ft below cloud with a visibility of not less than 3 nautical miles. If, in visual contact with the ground before completing the approach procedure, the entire procedure must be executed unless clearance has been given to proceed on a new flight path. Unauthorized divergence from procedure creates a hazard to other aircraft.

* * *

A K.L.M. proving flight left Amsterdam on January 26th on a new route to Batavia via Khartoum, Mauritius and Padang, and a second proving flight left on January 28th on the Amsterdam to Batavia route via Sharjah on the Persian Gulf, and Bangkok. The K.L.M. scheduled Amsterdam to Batavia service was suspended on December 23rd, 1948, when Egypt, India, Pakistan and Ceylon closed their airfields to Dutch aircraft as a protest against Dutch action in Indonesia.

L.A.C. PARTY : A celebrated group at the London Aeroplane Club's Banquet and Ball at the Savoy Hotel on January 28th. From left to right are : Capt. G. P. Olley, Mrs. Pike, Mr. G. S. Lindgren, W/C. C. A. Pike (L.A.C. Chairman), Mrs. Masefield, Mr. Peter Masefield, Mrs. Marriage, Mr. B. H. Marriage

It is expected that a twice weekly service will be operated on each route for mail and priority passengers only.

* * *

There are now 1,331 civil aircraft registered in Argentina, of which 13 are owned by charter companies, 342 by the Government and 224 light aircraft by flying clubs. There are 11 privately owned helicopters and 663 private aircraft. Of the 78 aircraft owned by commercial airlines, 27 are Douglas DC-3s and 11 are DC-4s.

* * *

Air Express services in the United States continued to increase during 1948. More than 4,000,000 shipments were handled during the year, an increase of 5.5 per cent over 1947, the weight of shipments was estimated at about 31,500 tons and the gross revenue at more than £4,500,000. The service was started in 1927 by the Railway Express Agency and the scheduled passenger airlines. It now operates on 18 scheduled airlines and 10 feeder airlines and the route mileage has increased from 79,112 in 1947 to more than 86,000 route miles in 1948.

* * *

Discussions in Melbourne on an air agreement between Ceylon and Australia have concluded, and it has been announced that Australian National Airways have bought 49 per cent of the shares in Air Ceylon. For ten years A.N.A. will supervise operations and develop workshops and other facilities in Ceylon, although during the development stage engines will be overhauled in Australia. At the end of the ten years the Government of Ceylon will have the right to buy back the shares from A.N.A. at market value. By agreement with the Indian and Pakistan Governments Air Ceylon will operate services to those countries with DC-3s, and a service between Ceylon and Great Britain is contemplated.

FROM THE CLUBS

WEST London Aero Club at White Waltham continues to do a very satisfactory amount of flying considering the time of year. On January 15th the Club gave its first film show which consisted of the first two parts of the technical film "Why an Aeroplane Flies," very kindly lent by Shell Mex, Ltd., which was supported by a drama of the Fleet Air Arm. This was so popular with members that the Club is arranging to have further film shows once a month. Miss Gore has started a series of lectures on meteorology which commenced on Saturday, January 29th.

* * *

NEGOTIATIONS with the Luton Corporation and the prospective new management of the Luton Flying Club are continuing. As reported in *Flight*, January 6th, the Hunting Flying Clubs, Ltd., are withdrawing from the Luton club on February 28th and the negotiations now proceeding concern the future lease of the airfield from the Corporation to those who wish to take over the club when Hunting's withdraw.

* * *

THE annual dance of the Cowes Aero Club, held on January 8th, was a very successful affair attended by about 150 members and guests, many of whom flew over the mainland and availed themselves of the free transport from the airfield to the Norton Chalet Hotel where the dance was held, and also of the hangarage and overnight accommodation facilities, which were arranged by the club. Flying weather in January has been very good at Cowes with consequently plenty of aerial activity; Mr. Basil Tubb, with only 20 hours' flying experience to his credit, recently flew a club Messenger to the Channel Islands and back.

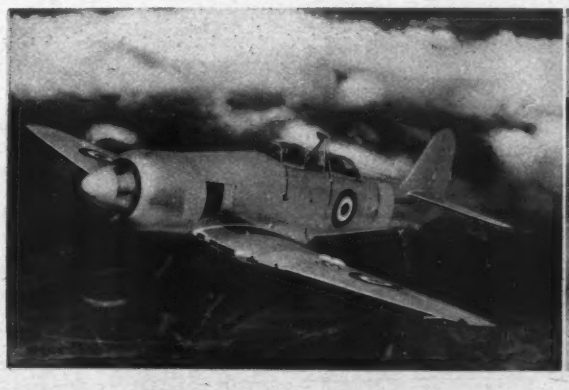
* * *

FLYING at the Midland Bank during the first three weeks of 1949 has totalled 32 hours; this is an increase over the 29½ hours flown in December; the November total was 32 hours. Although some members have left the club through being called up or leaving the Midland Bank staff, new members have joined, keeping the total membership at about 170, of whom approximately 60 are active flying members; the club's fleet consists of three Tiger Moths. On January 22nd an "open day" was held which was well attended and ended with a dance. Mr. R. A. Gifford, formerly secretary of the club has now succeeded Mr. Willis as captain and the latter has become vice-captain. Mr. Gifford's duties as secretary were taken over by Mr. Thetford on January 1st, 1949.

Sea Fury Trainer

AS the prototype of the Hawker Sea Fury T. Mk. 20 Naval trainer, in the uppermost of these new air-to-air studies breaks away from the photographic Dominie, its twin cockpits are obscured. Even so, the machine is distinguishable by the rear cockpit fairing and the ports for only two guns, instead of the four carried by the Sea Fury single-seaters. In the lower pictures the detachable pylon, supporting a mirror sighting device, is visible. This permits the instructor to aim from the rear cockpit over the head of his pupil, and has enabled the rear seat to be kept low. The engine, as in the Sea Fury Marks 10 and 11, now in regular service with Naval units, is a Bristol Centaurus 18

"Flight" photographs by L. W. McLaren



The Commanding Officer of No. 1832 Squadron displays his Seafire 46. (Rolls-Royce Griffon.) ("Flight" photograph)

Objective Culham

R.N.V.R. SQUADRONS EXERCISE WITH THE "REGULARS"

ARRIVING at Royal Naval Air Station, Culham, in good time on the chilly morning of Sunday, January 23rd, to witness the combined R.N.V.R./S.N.A.W. attack referred to in the preceding issue, *Flight's* representative was able to assimilate some useful information on the exercise then imminent, and on current R.N.V.R. air affairs.

Culham is the base of No. 1832 R.N.V.R. Squadron, which was supplying eight Seafires (Marks 17 and 36) for the strike : No. 1831 Squadron, from Stretton, had " laid on " four Mk. 17s, and No. 1833 (Bramcote), a similar formation. This well-equipped force of Reservists, it was explained, was to rendezvous near Castle Cary, south of Salisbury, at 1115 hrs., with sixteen Seafires from the School of Naval Air Warfare, the pilots having previously been briefed by two " S.N.A.W." instructors (Lt. D. A. Dick, D.S.C., R.N., and Lt. P. H. London, R.N.). Leading the Seafires of " 1832 " was Lt. Cdr. G. Mc.C. Rutherford, D.S.C., R.N.V.R. ; " 1833 " was likewise led by its commanding officer—Lt. Cdr. I. Gilchrist, R.N.V.R

Seafires of the R.N.V.R. squadrons, formed up after their strafe. It will be seen that all aircraft are equipped with drop-tanks.

Two Seafire 46s (one fitted with oblique camera) and two Mk. 47s, flown by R.N.V.R. pilots of No. 1832 Squadron. ("Flight" photograph)

—and the four machines of "1831" were in the charge of the Squadron's senior pilot. Thus three of the four existing R.N.V.R. squadrons were well represented. (The fourth—No. 1830, based at Abbotsinch and equipped with Fireflies—was not engaged).

The prospect of experiencing, from the focal point, a concerted assault by thirty-two Griffon-engined fighters, was an exciting one for all hands, from Captain J. Grant, D.S.O., (Commanding Officer, R.N.A.S., Culham) down. Commander Smallwood, R.N., with Cdr. Armour, R.N., was representing the Admiral Commanding Reserves. Regular and R.N.V.R. personnel—the latter including some of the 20 maintenance ratings on the strength of 1832 Squadron—stood by, chilled but cheery. In view of the urgent requirement for ex-Naval (Air) maintenance hands (a total of 190 is needed by " 1832 " alone) it seemed regrettable that prospective recruits could not have been present to watch the V.R. Seafires go into action. Happily, V.R. officers are more plentiful. Of 44 commissioned members of the Culham squadron, 36 are pilots.

In the remaining few minutes before the strike, one learned that No. 1832 Squadron is now organized on a three-flight basis, for greater convenience and operational efficiency. There are two regular Officer Instructors—Lt. I. G. W. Robertson, D.S.C., R.N., and Lt. W. T. R. Smith, R.N., and a regular Engineer Officer—Lt. (E) J. F. Martin, R.N. The supply of spares, Lt. Martin explained, is something of a problem, for the fourteen Seafires on hand are a mixed bunch of Mk. 17s and Mk. 36s, and the Harvards are likewise of two different sub-types (Mks. 2B and 3). A plan, announced last year, for arming all R.N.V.R. fighter units with Sea Furies is unlikely to materialize in the discernible future. Meantime, an apparently retrogressive, though nevertheless

Seafires at Culham after the attack described on these pages. Ex-Naval (Air) maintenance ratings are urgently needed for these aircraft ("Flight" photograph)

After a busy morning of co-operation with Royal Naval aircraft, R.N.V.R. Seafires spend an afternoon in formation drill. ("Flight" photograph)

Objective Culham . . .

necessary, move may be the withdrawal of the Seafire 46s and standardization of the earlier Mk. 17s. The Seafire 46, in any case, is an "interim" variant, lacking the folding mainplanes of the Mk. 47, as now used by Regular Naval units. In view of the decision that No. 1832 Squadron shall be embarked for a fortnight this summer in an aircraft carrier, standardization of equipment is naturally desirable. Though of earlier vintage, the Seafire 17 has a lively performance (top speed well over 400 m.p.h.) and respectable offensive powers (2 × 20 mm. + 4 × 0.303 in guns, and R.Ps or bombs).

The Strike

Sharp on time, at 11 30 hrs., the raiding Seafires bore down on Culham in open battle formation. Flying top-cover at 2,500-3,000ft. were the machines of Nos. 1831 and 1833 Squadrons; below, "1832" positioned themselves for an assault on the control tower and nearby dispersals, while the S.N.A.W. elements prepared to deal with installations and other dispersals on the far side of the airfield.

A beautifully co-ordinated attack ensued. Diving, whining Seafires came streaking past, at some 350 knots. One, in particular, scurried across the airfield at what might have been 4ft., easing up to clear the perimeter fence and making a getaway through a gap in the distant trees. Another made a bee-line for "control."

The raiders retired without "jinking." Though slower aircraft might have benefited by evasive action, it is considered that fast types, like the Seafire, are safer from light flak if they absent themselves without delay from the scene of action. The form-up was expeditious—faster, in fact, than under actual operational conditions, for the leaders feared the consequences of 32 Seafires, many of them practically indistinguishable except for their coloured spinners, milling indiscriminately around the sky. A formation fly-past which followed was very tidy, despite bumps, but rather too high for maximum effect.

The S.N.A.W. formations having broken off for their return to St. Merryn, the V.R. Seafires orbited preparatory to "landing-on" H.M.S. *Hornbill*, the official Naval designation of R.N.A.S. Culham. Lt. Robertson, Senior Officer Instructor of 1832 Squadron, planted himself by the end of the runway to wield his signalling bats, according to the American Naval system now standardized. Deck-landing conditions could not, however, be faithfully represented, for by reason of the short intervals between landings it was necessary for the pilots to "keep rolling" well up the runway.

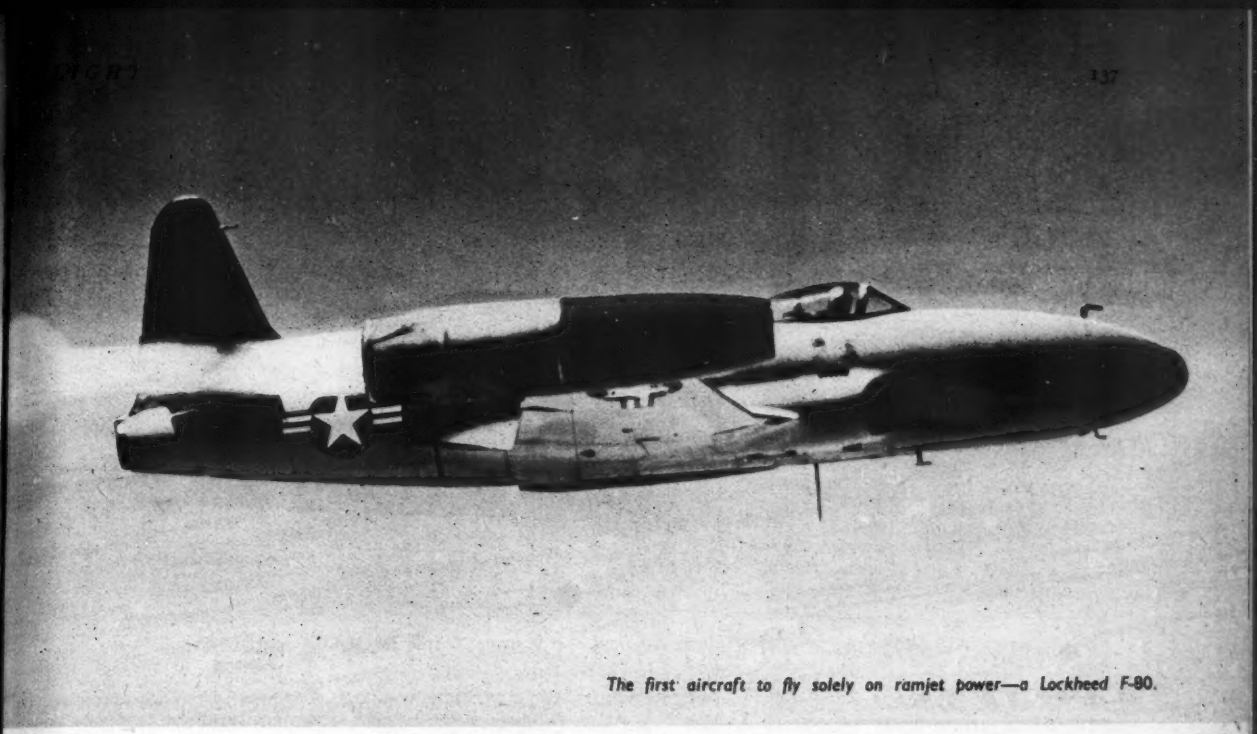
At debriefing, the S.N.A.W. instructors saw fit to criticize only minor aspects of the exercise. The "tell-off" had, frankly, impressed one of these officers as "ropey," though the subsequent form-up was "not bad." Some pilots had experienced unpleasant cloud on course for the rendezvous, but the formations were slightly early at Salisbury, on-time over Yeovil, and "not 30 seconds late" at Castle Cary. The S.N.A.W. force had been a full minute early, but instead of orbiting, pressed on to the attack, necessitating a stern chase by the V.R.s. Some straggling in the top cover was noted, but otherwise the Regular experts were unstinting in their praise.

Having been impressed, like other observers, by the contour-chasing prowess of the R.N.V.R. pilots, the writer gratefully accepted the rear seat of a Harvard, scheduled for low-flying practice in the afternoon. To the pilot—Lt. M. R. H. Shippey—he is indebted for an intimate knowledge of the Oxfordshire railway system and of the grassy hill-tops which abound in the practice area. With a newly installed engine the Canadian-built Harvard cruised for an hour at 150-160 m.p.h. on a mere 1,800 r.p.m. Extreme manœuvrability and tractability have made the type as popular among Naval pilots as in R.A.F. units, and until Balliols or Athenas reach Reserve units some years hence it will continue to serve.

H. F. K.

R.N.V.R. RECRUITING

FORMER Naval Airmen who have served in aircraft carriers and at naval air stations are urgently needed for part-time service in the R.N.V.R.'s four Air Squadrons, at Culham; Bramcote, near Nuneaton; Stretton, near Warrington; and Abbotsinch, Glasgow. Men are required to enrol in the following categories; airframe, engine, and electrical maintenance ratings; ex-seaman ratings with the air non-substantive qualifications of safety equipment, aircraft handlers and meteorologists; also ex-seaman ratings employed as aircraft handlers before the introduction of the non-substantive rate; photographers and supply assistants (air). Full details of service may be obtained from Commanding officers of the nearest of the four air stations.



The first aircraft to fly solely on ramjet power—a Lockheed F-80.

RAMJETS

Some Experimental Applications : America Goes Ahead

FEW devices have borne such a diversity of names as the aircraft heat engine now generally called "ramjet," but otherwise known as "athodyd" (aero-thermo dynamic duct); "propulsive duct"; "compressor-less thermal jet"; "Lorin duct" or "Lorin nozzle"; "continuous thermal duct"; or "aeroduct."

The ramjet can be characterized as a continuous-firing duct, burning fuel with air compressed by the effect of ram, and expanding the products of combustion rearwards to produce thrust. Though capable of operation at subsonic speeds, it is relatively inefficient under these conditions, and, having no static thrust, must be accelerated to its initial operating speed by some independent means of propulsion, e.g., booster rocket. Being dependent upon an external source of oxygen, its output, like that of the turbojet, tends to decrease with height.

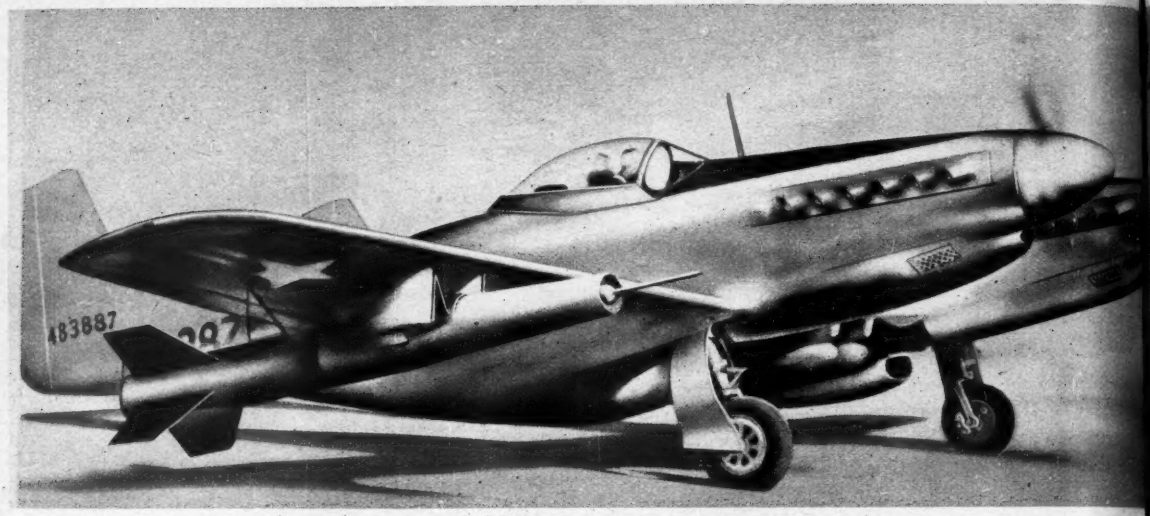
A near-relation of the pure ramjet is the "pulsejet" (*alias* "pulsating," or "stuttering," athodyd; "resonance jet"; "intermittent-firing duct"; or "Argus tube"). In this unit, which is typified by the power plant of the German Fi 103 ("V-1") flying bomb used in 1944 and 1945, the tubular body is fitted at its forward end with a series of flat spring-loaded admission valves and fuel-injection nozzles. Air pressure on the nose forces the valves open, and the air is rammed into the duct, where it mixes with the fuel for combustion, and rapid expansion is promoted. By careful proportioning of the tailpipe, a rise in pressure is utilized to close the valves. Violent ejection of the gases creates a depression which, in conjunction with external air pressure, opens the valves to admit a fresh charge of air; thereupon the cycle is repeated. The unit fitted to the V-1 operates at a frequency of about 2,800 cycles a minute, and the missile attained a speed of about 375 m.p.h.

The aero-thermo-dynamic propulsive principle, that is a thermal duct without valves, was proposed as long ago as 1913 by a Frenchman, M. Lorin, but for many years aircraft speeds were so low that no practical work could be undertaken. At the Paris *Salon d'Aviation* in 1938, however, a ramjet monoplane by another French engineer, René Leduc, was exhibited in model form, with a placard suggesting that a speed of 1,000 k.p.h. should be attained with an output of 14,000 h.p. On November 16th, 1946, a ramjet aircraft built along similar lines by Bréguet, and designated Leduc 010, was first air-launched from a superstructure built on the fuselage of an Aerosudest Languedoc four-engined airliner. A successful glide descent was made from some 16,500ft, but since this occasion little information on progress has been forthcoming.

Northrop Black Widow with underslung ramjet of rectangular section.

In effect, the Leduc 010 has an inner and an outer fuselage shell, the inner housing a pilot and observer, and being surrounded by an annular duct which forms the ramjet. The pointed nose section is jettisonable in emergency, and the main airframe structure is provided with four parachutes for recovery.

Since the war America has carried on experiments with improved ramjets. The U.S. Navy experimented with a 70-lb ramjet missile of 6-inch diameter; known as the Cobra, this was part of "Project Bumblebee," and a specimen was rocket-launched from a ramp at Island Beach, New Jersey, as early as June, 1945. Well over a year ago it



North American Twin Mustang carrying 16-inch ramjet missile for N.A.C.A. tests.

RAMJETS . . . . .

was revealed that a ramjet missile constructed for the U.S. Navy had exceeded a Mach Number of 1.84 and that a N.A.C.A. missile, drop-tested from a Superfortress flying at 30,000ft, had bettered Mach 2.0.

Reference was made during 1947 to the part being played in ramjet development by Boeing (at its Suffleton Combustion Laboratory); General Electric (as part of its "Project Hermes"); Allison; Curtiss-Wright; Ryan; Menasco; Continental; Marquardt; and Aerojet. The N.A.C.A. and the Applied Physics Laboratory of the Johns Hopkins University, have also been concerned, and the McDonnell Aircraft Corp. is studying the possibilities of ramjet propulsion for helicopters.

In the world's largest supersonic wind tunnel (test section 6 x 8ft) in the N.A.C.A.'s Lewis Memorial Laboratory at Cleveland, ramjets are being tested up to Mach Numbers of 2 under conditions obtaining at 35,000ft. Additional facilities are available in the Aircraft Engine Research Laboratory of the N.A.C.A., where a wind tunnel permits operation of ramjets under simulated high-altitude supersonic conditions.

Subsonic Marquardt

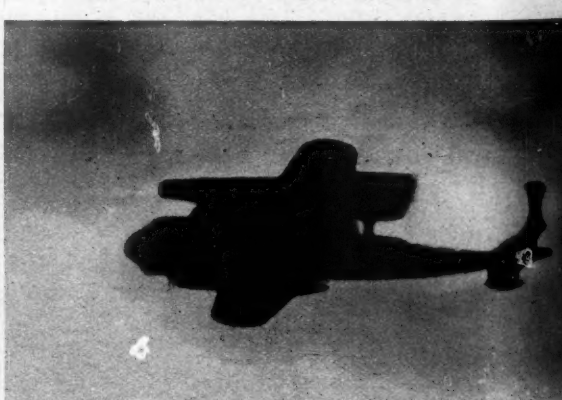
The first of the American ramjets to be "declassified" is the subsonic Marquardt C30-1.0, in which designation the figure "30" signifies the diameter in inches and the "1.0" the designed limiting Mach Number. Constructed by the Marquardt Aircraft Company of Venice, California (a subsidiary of the Aerojet Engineering Corp.) to designs by the University of Southern California, and under the supervision of the Power Plant Laboratory of Air Material Command, U.S.A.F., Wright Field, this unit is 11ft long and at Mach 1.0 at sea level is said to develop the equivalent of more than 20 thrust h.p. per pound weight. Specific fuel consumption is fully four times that of a typical turbojet, but the C30-1.0 may, nevertheless, prove efficient as a power unit for short-duration missiles in the design of which the light weight may offset the heavy fuel consumption.

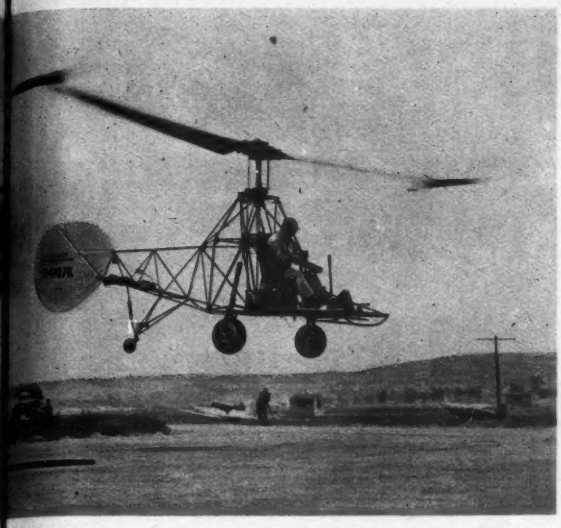
Complete structural details are withheld, but it is known that the essential components, from front to rear, are (1) an inlet-diffuser section, in which the rammed air is decelerated to an appropriate velocity for combustion, with a corresponding conversion of kinetic energy to pressure; (2) a fuel injector which produces a fine spray; (3) a "flame holder," in the form of a grid, which maintains stable combustion; (4) a ceramic-lined combustion chamber; and (5) an exit nozzle designed to speed up the gases so that the products of combustion are exhausted at approximately ambient pressure and at a velocity about twice the flight speed. Other than the fuel pump, there are no moving parts.

An experimental installation of the C30-1.0 has been made in a Lockheed F-80 Shooting Star turbojet fighter of the U.S.A.F., two units being attached at the wing tips. This machine was the first piloted aircraft to fly solely under ramjet power. Development was undertaken in the light of experience with a Mustang, likewise having tip-mounted Marquardt ramjets, though these were of an earlier 20-inch design. Flight trials have also been made with the Bell F-83 turbojet fighter prototype and a Northrop Black Widow, the latter having a small ramjet, of rectangular cross section, suspended beneath the fuselage.

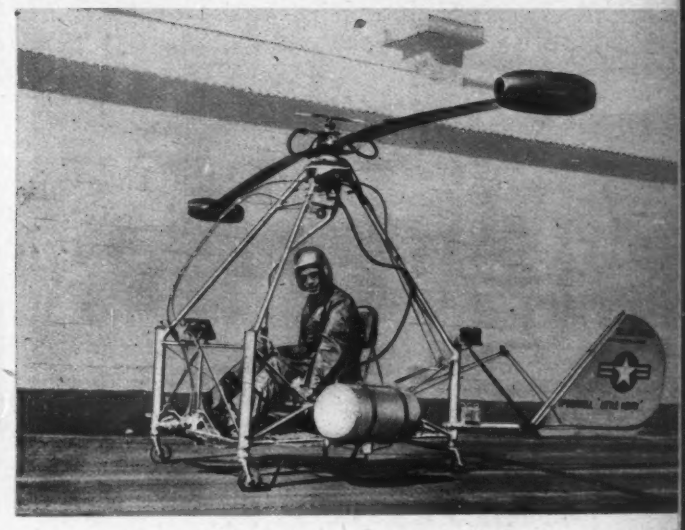
Marquardt subsonic ramjets measuring 7ft in length, and having a maximum diameter of 20 inches, are being extensively air-tested in PTV-N-2 (Gorgon IV) pilotless missiles ("PTV" = Propulsion Test Vehicle), built by the Glenn L. Martin Co. for the U.S. Navy. Although fuel for only 4¼ minutes is carried, several remotely controlled flights of more than ten minutes' duration have already been recorded after launches from beneath the wing of a Northrop Black Widow, in the Point Mugu area, California. The Gorgon IV, a high-wing monoplane 22ft long and 10ft in span, weighs 1,600 lb, of which 700 lb is ordinary 80-octane petrol for the ramjet. After ignition by a spark plug, burning is continuous until the fuel is exhausted. Data relative to the performance of the ramjet

"Pick-a-back" mounted Saenger ramjet on a Do217E.





Marquardt M-14 Whirlajet helicopter, with pulsejet propulsion.



"Little Henry"—McDonnell's ramjet-driven helicopter.

are telemetered to a ground receiving station, together with details of speed, height, brake drag and controllability. Upon cessation of powered flight a parachute can be set to operate automatically, and several Gorgons have been recovered so little damaged that only a small amount of work was necessary to prepare them for further flight. On the "mother" aircraft, the weight of the Gorgon (suspended beneath the starboard wing) is counterbalanced by a tank under the opposite wing, filled with fuel. This fuel is pumped into the wing tanks of the Black Widow as fuel for the Gorgon's ramjet is transferred to the missile prior to launching.

The U.S. Navy is fitting out U.S.S. *Norton Sound* for the deck-launching of Gorgons and other missiles, and the Gorgon IV test programme has been transferred from Point Mugu to Chincoteague, Virginia, nearer to the Martin factory and giving better access to technical facilities.

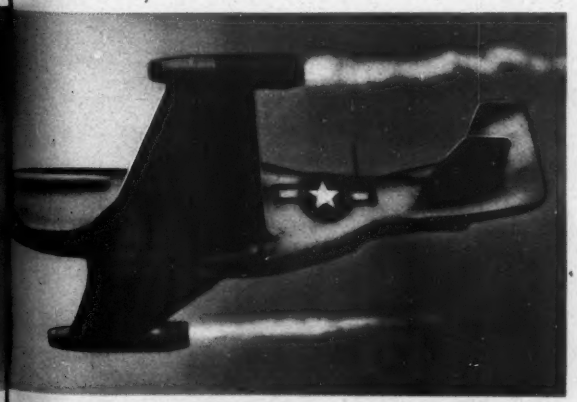
Somewhat meagre particulars have lately been released concerning an experimental ramjet of 16 inches diameter, utilized by the N.A.C.A. for supersonic tests up to Mach Numbers of 2.4. Originally drop-tested from a B-29, units of this type are now being flight-tested from a North American Twin Mustang. Measuring 14 feet in length, they are attached beneath the wings and are provided with a compartment, located in the inlet section, containing a radio transmitter, controls and fuel. In the nose is a long antenna for the transmitter, and at the rear, four fins to provide aerodynamic stability.

A supersonic ramjet, developed for the U.S. Navy by the Aerojet Engineering Corporation, in conjunction with the Johns Hopkins University, has a diameter of 15 inches and weighs some 150 lb. The designed thrust is 2,650 lb at 1,500 m.p.h.

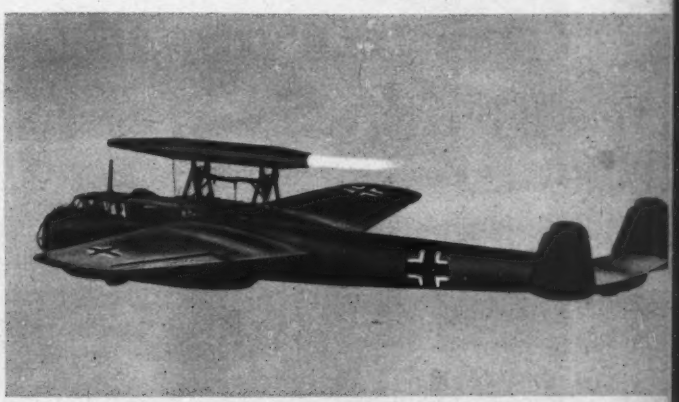
The Germans were quick to appreciate the possibilities of the ramjet as a power plant for fighters, short-range bombers and guided missiles. Development was at first the concern of Walter at Kiel and of Dr. Saenger of the D.F.S., but whereas Walter did not progress beyond the model stage, full-scale ramjets of Dr. Saenger's design were flight-tested on aircraft. A unit of 2,400 e.h.p. was tried on a Do 17Z and one of the 20,000 e.h.p. on a Do 217E. Numerous designs existed for ramjet fighters. Focke Wulf proposed a machine with two units of the Pabst type, more compact than the Saenger and promising remarkable efficiencies, even at subsonic speeds. These were mounted at the tailplane extremities, and a Walter bi-fuel rocket would provide take-off thrust. The ramjets were less than 9ft long and about 4½ft in diameter. They were estimated to give a top speed of 680 m.p.h. at sea level, and a time of climb to 36,000ft of less than 2½ minutes. At sea level the calculated range was 140 miles, and at 36,000ft, 430 miles. Heinkel planned a machine with a ramjet, 16ft long, in each wing root, and the Skoda works were studying a design in which a 31ft Saenger athodyd was mounted in an exceptionally bulky fuselage, with the pilot lying prone above. For a sea-level speed of 630 m.p.h. the thrust was 9,700 lb.

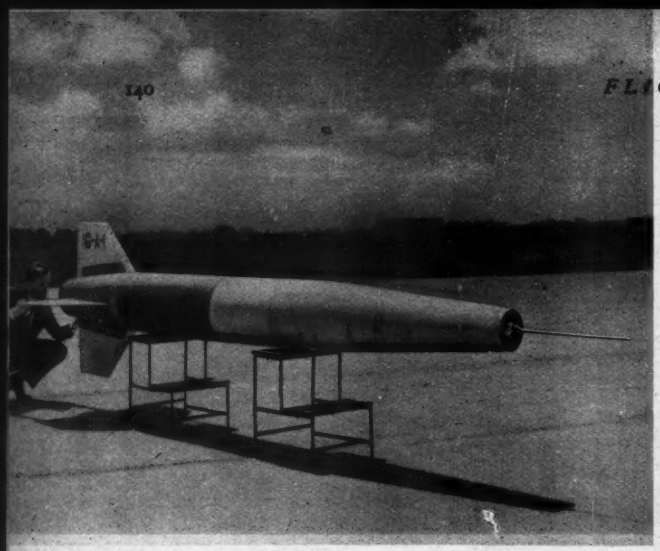
Delta-wing ramjet fighters by Lippisch were designed

Tip-mounted ramjets applied to a North American Mustang.

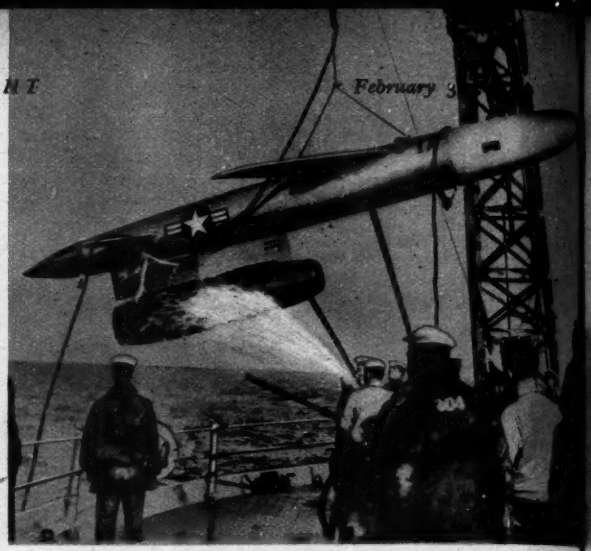


Do17Z with an experimental Saenger ramjet.





The N.A.C.A.'s 16-inch supersonic ramjet, showing transmitter antenna.



A Gorgon IV is washed down after salvaging from the sea.

RAMJETS.....

to use not only liquid fuel, but coal, carried in a circular rotating basket in the duct. It was calculated that 1,760 lb of coal would allow the Lippisch P.13 fighter a 45-minute endurance.

Concerning British experiments very little can be said. A certain amount of small-scale wind-tunnel work has been undertaken, and during 1946 a model of a hypothetical ramjet aircraft was displayed at Farnborough. In this design the pilot lay prone in a long enclosure above the duct; fuel was accommodated in the thick wing, and the take-off was to be made under rocket power.

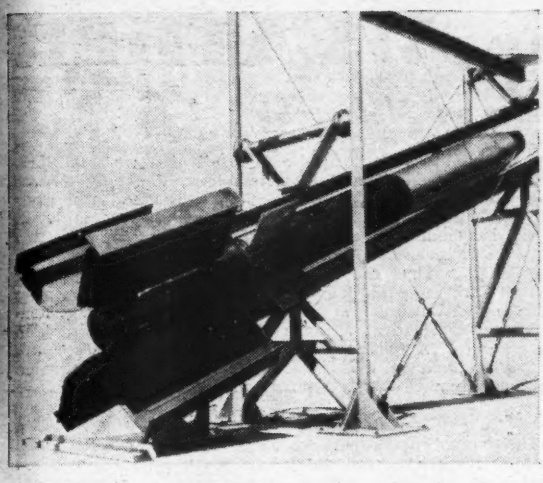
A promising vehicle for the utilization of the ramjet is the helicopter, a class of aircraft which further appears to be amenable to propulsion by pulsejets. It has been pointed out by Mr. R. H. Miller, of the McDonnell Aircraft Corporation (which concern has been engaged for some three years on the development of jet propulsion for helicopter rotors), that the relatively high tip speeds required in order to realize a reasonable jet efficiency result in a considerable reduction in the aerodynamic efficiency of the rotor. Although this efficiency may be improved by decreasing the rotor solidity, a practical limit is reached, in the case of jet drives involving airflow through the blades, beyond which the specific fuel consumption increases almost asymptotically with decrease in solidity. The great weight-saving possible with such drives, and their simplicity, may, however, in some cases offset their low aerodynamic and propulsive efficiencies.

Dubbed "Little Henry," an experimental McDonnell ramjet helicopter has already completed some hours of test flying. Solely a test bed for the propulsive system, this machine has no immediate operational application; it is being developed for the U.S.A.F. in conjunction with the Air Force Propeller Laboratory and the Rotary Wing Section at Wright Field. The first flight was made during May, 1947, but on that occasion fuel was fed from the ground. For subsequent flights fuel was carried by the machine itself.

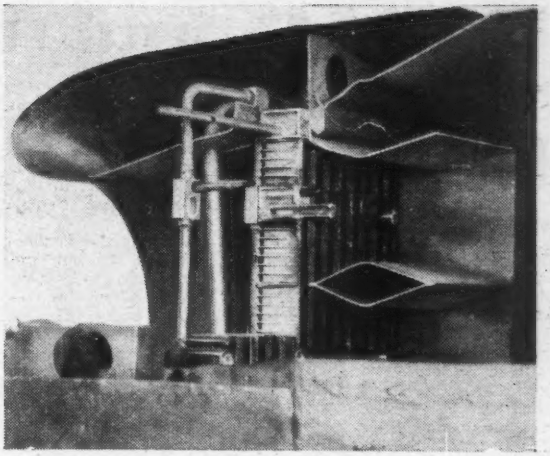
At the tip of each of the two blades is a stainless-steel ramjet, burning propane. The tip-mounted ramjets rotate at some 600 ft/sec and, as no torque is developed, no tail rotor is necessary. Behind the pilot is a combustion heater for pre-heating the fuel before it is fed to the power units, and an auxiliary starter is needed to speed up the rotor until the tip speed is sufficient for the ramjets to take over. Though the jet units weigh only 10 lb apiece, they have already propelled the J-1, to give "Little Henry" its official title, at 50 m.p.h. Developments include conversion from propane to ordinary aviation petrol.

The remarkable little McDonnell is not to be confused with the Marquardt M-14 Whirlajet, another experimental helicopter which differs in having tip-mounted pulsejets instead of simple ramjets. (It has lately been learned that a modified version of "Little Henry" may likewise have pulsejets.) Fuel is supplied, and ignition effected, through the hollow rotors, and the remarkably compact pulsejets are started by supplying a jet of air from a portable compressor, manually directed into the intakes. When resonance occurs the air compressor is removed and the

Air-to-air view of Martin-built Gorgon IV pilotless ramjet missile.



A ramjet missile, complete with its rocket attachment for launching, is seen on the ramp at the U.S. Navy's Ordnance Station in California. Supersonic speeds have been attained.



The nose section of this "Argus tube" (pulsejet as fitted to the German V-1 flying bomb) has been cut away to disclose the block of air valves and the rearward-facing fuel nozzles.

Ramjets . . . . .

rotor freed for power operation. Plans are in hand for a built-in starting system, comprising an air compressor and tanks in the fuselage, with transmission of air to pipes, integral with the rotor blades, via a rotary seal. The source of ignition is an ordinary coil and battery, which passes current from slip rings on the rotor hub.

Due to the mass of the pulsejets at the blade tips, stability in hovering and forward flight is reported to be "beyond expectations." Like *Little Henry*, the Whirlajet needs no tail rotor inasmuch as no torque is transmitted to the fuselage. It will be appreciated that both types differ fundamentally from the German Doblhoff designs and the French SO-1100 which, though having jet-driven rotors, utilize an engine in the fuselage to supply compressed combustible mixture to the jets at the blade tips.

Most remarkable of the rotating-wing aircraft designed for ramjet drive was a Focke-Wulf fighter project of the late war years. Three vanes, each with a ramjet, replaced the normal wing, and for take-off the machine was to be stood vertically on its tail, initial rotation of the vanes being effected by Walter rockets built into the ramjet units. During this initial phase, the vanes would be in neutral pitch, but when moved into fine pitch, lift would be imparted, partly due to the rotation of the vanes, but also to the components of ramjet thrust parallel to the fuselage axis. As speed increased, the machine would assume a horizontal attitude, and the vane pitch would be adjusted to give a Mach Number at the tips of 0.9. A sea-level speed of 620 m.p.h. was estimated, and the initial climb, to 3,250ft, would take 8.2 seconds.

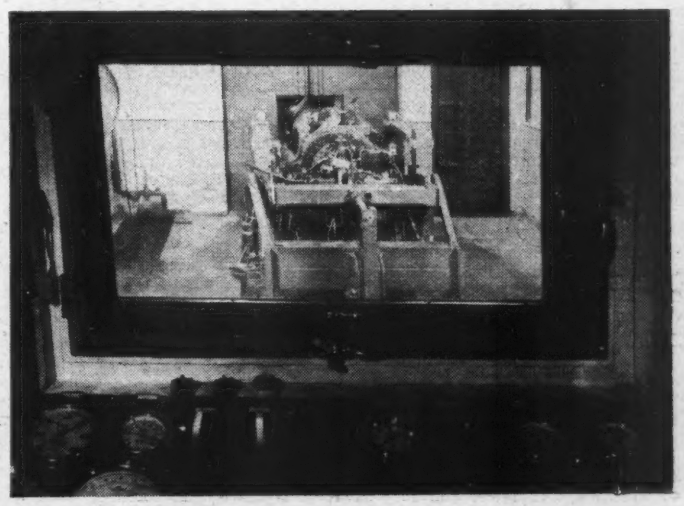
It may be observed, by way of conclusion, that if turbojets can be adapted for efficient operation at Mach Numbers between 1 and 2, by decelerating the inlet air to subsonic speed without incurring prohibitive losses, the adoption of ramjets for piloted military aircraft may be delayed. Nevertheless, there are strong indications that, within a few years, ramjet propulsion will be effectively applied to guided missiles, and that its use may be extended to certain classes of rotating-wing aircraft.

100 HOURS AT COMBAT RATING

A RECENTLY announced 100-hours endurance test, under combat conditions, by a Rolls-Royce Derwent 5 turbojet recalls a similar test completed by a Merlin piston engine in 1945. The Derwent 5 is the first turbojet in the world to complete such a test.

By way of background, it may be recalled that about a year ago Rolls-Royce submitted a Derwent 5 to continuous test for 500 hours at varying loads; but whilst this trial of reliability was severe, the running conditions did not exceed normal overload limits. It was decided, therefore, to carry the endurance test a stage further and run a unit at its maximum overload conditions and at its current rating, within the present operational limitations of 14,700 r.p.m. and 680 deg C jet pipe temperature. The schedule called for 100 hours' running under combat conditions. In this connection it must be remembered that in a normal 150-hour type test only ten hours' running under combat conditions is called for, and that in flight a pilot is allowed to operate his power plants at combat rating for only ten minutes at a time. The recent test was successfully completed without any servicing or maintenance.

An especially interesting aspect of the trial was the extraordinarily high thrusts developed, partly due to the low temperatures prevailing at the time. The normal rating of the Derwent 5 is 3,600 lb static thrust at 14,700 r.p.m., and the test schedule laid down comprised twenty five-hour cycles at full power. Observed thrust of 3,810 lb at 14,700 r.p.m. was recorded at the beginning of the test, and halfway through (actually during the ninth cycle) the Derwent was developing over 3,900 lb thrust for more than five hours.



The Derwent 5 in the test cell.

RADAR and the WEATHER

Applications to the Science of Meteorology

IT has been said that, without radar, Fighter Command could not have won the Battle of Britain, nor could the weight of Bomber Command have been brought to bear on the enemy; it has further been hailed as the greatest single invention of the 1939-45 war.

Apart from its normal functions in aviation, the applications of radar have been few. Since the war, the Telecommunications Research Establishment, in conjunction with the Meteorological Office, has been making a study of possible uses of radar to the science of meteorology, and a synopsis of the results of these investigations was given in a paper, *Radar as an Aid to the Study of the Atmosphere*, before the Royal Aeronautical Society on January 27th. The author, Dr. F. E. Jones, M.B.E., B.Sc., Ph.D., A.M.I.E.E., is Senior Principal Scientific Officer at T.R.E., and is Chief of the Department of Experimental Physics.

With the advent of microwave radar in 1941, it soon became apparent that echoes were obtained from precipitating clouds, rain and snow. Recent research has been directed to discover the possibility of employing microwave radar to give advance warning of approaching rainbelts. The work has brought to light some new evidence concerning the formation of rain, and it now seems possible that radar will be able not only to indicate distant areas of precipitation, but also to give a quantitative estimate of the amount of precipitation occurring.

The measurements obtained at T.R.E. were made with a radar set working on a wavelength of 3.2 cm and directed vertically upwards towards the falling rain. Simultaneously, measurements were made of the precipitation rate with a recording raingauge. Although measurements were made at various heights, they were converted to equivalent values at 3,000ft on the assumption that, since the precipitating area completely filled the aerial beam, the power was inversely proportional to the square of the range. Measurements which were made only during conditions of steady rainfall confirmed that this assumption was valid and that precipitation was uniform from the ground up to the height at which the measurements were made.

When investigating echoes from rain with the radar directed vertically, it was noticed that, although echo intensity decreased with height, as would be expected, a considerable increase in power was observed from a thin layer at a certain height. This strong echo, termed the "bright-band," has been observed by workers in many parts of the world. Experiments have established that the bright-band is located a little below the freezing level, and that the echo power is five to nine times greater than the echo from the rain just below the bright-band. Above that level, the echoes are very much smaller and vary considerably in strength.

History Of Cloud Warning

With certain types of clouds, such as cumulo-nimbus, convection currents are sometimes so violent that they present a danger to aircraft. Such clouds are invariably associated with heavy precipitation, and it was therefore of interest to study the radar response obtained from them. In the summer of 1946, a party of scientists from T.R.E. flew to the Singapore area in a specially-fitted Lancaster to make an airborne study of the cumulo-nimbus cloud problem. The radar set operated on a wavelength of 3.2 cm and the performance was such that towering cu-nim clouds were seen up to ranges of 100 miles, and measurements of the echo intensity indicated that the rainfall associated with them was of the order of 2in per hour, which is a normal value of the tropical monsoon areas.

As a result of the Singapore experiments, a cloud warning radar for aircraft installation was designed at T.R.E., and subsequent development and production undertaken by E. K. Cole, Ltd., Malmesbury. The apparatus works on a wavelength of 3.2 cm, and the position of heavy raincloud up to a range of about 40 miles is indicated.

With the greater power available, it has proved profitable to use 10 cm as the operating wavelength for radar ground stations to indicate storm centres. Such high-performance equipment is capable of detecting heavy rainstorms at ranges in excess of 150 miles, and in tropical regions the use of radar in giving early warning of the approach of rainstorms is proving invaluable, particularly to the forecaster who is concerned with the operation of aircraft. It has proved possible to issue short-term forecasts of bad landing conditions, often to within five minutes, and to estimate the duration of the unserviceability of an airfield as a result of storm conditions.

There is a requirement in meteorology, especially for use in weather ships but also on airfields, for a method of measuring the height of a cloud base from a single station. J. W. Ryde has indicated that the echo power from reflecting particles is inversely proportional to the fourth power of the wavelength. Thus the power of a set on a wavelength of 6 mm, with an aerial 30in diameter, would have to be more than 300 kW in order to give an echo from an average non-precipitating cloud at a range of 10,000ft. Thus, attention has been given to the possibility of using the large peak power available in the visible light region of the spectrum obtained from electrical discharges in gases.

Flash Light Radar

The experimental cloud-base meter designed at T.R.E. uses as a source a high-voltage electric spark produced between aluminium electrodes placed at the focus of a searchlight mirror: the duration of light pulse is less than 1 microsecond. The pulse reflected from the cloud base is received on the second searchlight mirror which focuses the light on to a photo-electric cell, the resultant current pulse being amplified and displayed on the cathode-ray tube in the usual radar manner. The peak power of the spark is about 11 megawatts, and the efficiency is such that, with the mirror system used, a flux of about 4 million lumens is obtained on a distant cloud.

Much thought has been given to study of the upper atmosphere, particularly with a view to determining how changes at such high levels influence the weather on the earth. The radio-sonde equipment enables routine measurements of pressure and temperature to be made up to altitudes of about 60,000ft, but it is difficult to make measurements above this height. The author suggested in 1946 a relatively simple method of exploring the upper atmosphere—the outcome of a proposal by Synge, who suggested measuring the molecular scattering from great heights by means of a modulated searchlight beam.

The apparatus proposed for this measurement consists of a high-power pulsed light apparatus, similar in arrangement to the cloud-base meter already described. As the measurements will be made at night in a clear atmosphere, a photo-multiplier can be used as a detector in place of the photo-electric cell. In addition, accurate range measurements are not required, and hence the pulse shape is not as important as in the cloud-base meter equipment.

With the general tendency of aircraft to operate at higher altitudes, the problem of providing accurate wind data has become more difficult. However, a radar system of wind finding has been in use in this country for some time. The measurement is made by following a balloon-borne radar target, taking the form of a corner-reflector, from a powerful 10 cm ground station.

The problem of long-range accurate wind finding has been studied at T.R.E., and a system employing secondary radar (i.e., a pulsed ground station) working in conjunction with a responder has been designed and is in process of development. In this system, the outgoing transmission from the ground consists of two microsecond pulses on a wavelength of about 2 metres. The associated balloon-borne responder consists of a miniature 2-metre receiver, the output of which is fed, via a modulator valve, to a small triode oscillator working on a wavelength of about 10 cm. The power supply of the balloon-borne system consists of small batteries especially developed for the purpose.

The outgoing 2 microsecond pulses from the ground station are transmitted back on a wavelength of 10 cm and are received on a paraboloidal aerial of 5ft diameter. The aerial system has been designed to "lock-on" to the responder signal and to follow it during its motion through the atmosphere quite automatically and with great accuracy. The "lock-follow" aerial system indicates the azimuthal angle, the elevation angle and, in addition, the radar display indicates the range. The differentials of these are also available, and it is intended to feed these parameters into a computer which will indicate values of the velocity and direction of motion of the responder, i.e., wind speed and direction, on two dials.

Early flight trials have indicated that the responder can

RADAR and the WEATHER . . . . .

be followed easily up to ranges of 100 miles. The maximum height reached during any ascent has been 70,000ft, the limitation being that the balloons burst at this height.

The most widely used meteorological instrument is the radio-sonde. The sonde system in general use in this country and overseas consists of a radio apparatus operating on a frequency of 27 mc/sec., which is arranged to transmit readings from the balloon-borne meteorological instruments. Wind speed and direction can be obtained from this system, although not very accurately, by measuring the bearings of the balloon-borne transmitter from three suitably located ground stations. At T.R.E., the wind-finding responder is being adapted for use as a "radar-sonde" with meteorological instruments to measure pressure, temperature and humidity mounted towards the top of the responder. The fundamental problem in telemetering the information from the instruments is to transmit to the ground with extreme accuracy the angular displacement of the arms on these instruments.

The actual radar pulses are used as a communication channel in the system and various methods of achieving the high degree of telemetering accuracy required are being tried. The first experimental model used a chronometric unit (made by Kelvin, Bottomley and Baird, Ltd., Basingstoke), and in this system the angular deviation of the arms of the instruments is measured in units of time. The units of time and the integral number of these units pertaining to each instrument is then transmitted to the ground station by means of a width modulation of the radar pulses sent out from the centimetre triode valve.

It has proved difficult to achieve the necessary high degree of accuracy required by the meteorologists—one part in one thousand—with the mechanical moving parts in the chronometric unit, and the possibility of making an all-electronic unit is being investigated. At the ground station, the readings of the instruments will be recorded automatically, both on graph paper and a teleprinter, so that they can be passed easily to the forecaster.

Considerable experimental work has still to be done in the development of a meteorological radar-sonde, but the work done so far indicates that microwave radar will play an important part in the future of this very important instrument.

NORTHOLT STAFF TO BE REDUCED

ABOUT 100 engineers on the staff of B.E.A. have become redundant. Check 4 overhaul on the Viking has been increased from 400 to 480 hours and in the C. of A. hangar a more efficient repair system has reduced the number of man-hours required. Some of these redundancies will become effective immediately at Northolt but it is not yet known whether the effect will be similar at the B.E.A. maintenance base at Renfrew. Discussions are now under way between representatives of the Corporation management and Trade Union officials, although the Unions concerned were in touch with the situation throughout and agreed the procedures recently instituted.

BLACKBURN APPRENTICE TRAINING

IN a booklet entitled *Aeronautical Engineering as a Career*, published by Blackburn Aircraft, Ltd., the company's apprentice training scheme is described. In a foreword, Mr. Robert Blackburn, the founder of the company, stresses the importance of maintaining and nourishing the industry by the constant introduction of young blood. The several divisions of the Blackburn apprentice scheme come under three main headings: the General Aircraft Engineer Apprentice, the Student Apprentice and the Trade Apprentice, with the additional up-grading classes of Drawing Office Apprentice and Production Engineer Apprentice. The aims of the general aircraft engineering apprenticeship of five years' duration are to give, during the first two years, a general cross-section of practical experience during the trainee's most receptive years. The theoretical instruction is arranged for at the Hull Municipal Technical College. The second half of this course is devoted to gaining the Higher National Diploma with Aeronautical Subjects, and successful candidates not only receive this Diploma but the exemption from Sections A and B of the examination for Associate Membership of the Institution of Mechanical Engineers and from the equivalent sections of the A.F.R.Ae.S. examination.

The Student apprenticeship course is nominally of two years' duration, and Section A is designed to give those who have obtained a University degree a fully comprehensive training in workshop practice and, if desired, specialized training in theoretical subjects. The general curriculum followed is similar to the first portion of the general aircraft engineer apprentice which is devoted to general practical experience in the many departments of the factory. Section B is for those who, although of good general education and experience in the engineering branches of the three Services, have not obtained a degree, but wish to fit themselves for positions on the practical side of the industry as production engineers, etc.

The trade apprenticeship course has been drawn up to afford opportunities for boys to take up one of the special skilled trades carried on by the company, and this course is designed to produce skilled craftsmen such as fitters, turners, machinists, engineer fitters, for which there will always be a steady demand. The important feature of this course is the possibility of up-grading on merit to the drawing office apprentice and the production engineering apprentice sections. Trade apprentices who are successful in passing the examination for the second year of the Ordinary National Certificate may make application to be up-graded to the Drawing Office Training Section during the latter portion of their apprenticeship, or, should they prefer, to the Production Engineering Training Section. In order to assist apprentices to take the Higher National Diploma course the Robert Blackburn Scholarship was instituted in May, 1944, and the ward is made annually to the apprentice who obtains the highest average pass in the National Certificate examination. A sum of £50 per annum is awarded for the duration of the Diploma course provided satisfactory progress is maintained. Copies of the brochure describing the Blackburn training scheme and detailed information are obtainable on request from the Apprentice Supervisor, Blackburn Aircraft, Ltd., Brough, Yorks.

TOWARD CHEAPER FLYING

THE Royal Aero Club publishes from time to time additional names of firms added to the original list of those companies approved by the R.Ae.C. to maintain and certify privately owned aircraft in accordance with the General Aircraft and Engine Maintenance Schedules R.Ae.C./1 and R.Ae.C./2 referred to in previous issues of *Flight*. The Club announces that these Schedules, formerly applicable to single-engined aircraft of less than 3,500lb weight now include the Miles Gemini twin-engined aircraft; the weight limit still remains at 3,500lb. The complete list of approved firms appears below.

Air Service Training, Ltd., Hamble.
Aircraft Repairs, Ratcliffe.
Airtech, Ltd., Thame.
Airwork, Ltd., Hounslow, Blackbushe, Gatwick, Langley and Perth.
Auster Aircraft, Ltd., Rearsby.
Blackburn Aircraft, Ltd. (Operations Section), Brough.
British Air Transport, Ltd., Redhill.
Brooklands Aviation, Ltd., Weybridge, Brooklands and Sywell.
Cambrian Air Services, Ltd., Pengam Moors.
Chilton Aircraft Co., Ltd., Hungerford.
Chrislea Aircraft, Ltd., Exeter.
C.L. Air Surveys, Ltd. (Head Office), 140, Cromwell Road, S.W.7, and Doncaster Airport.
College of Aeronautics, Cranfield.
Currie & Hanvey, Ltd., Squire's Gate.
de Havilland Aircraft Co., Ltd., Hatfield.
Derby Aero Club, Derby.
Elliotts of Newbury, Ltd., Welford.
Essex Aero, Ltd., Gravesend.
Field Aircraft Services, Ltd., Croydon, Tollerton and Lympne.
Goodhew Aviation Co., Ltd., Kidlington.
Hampshire School of Flying, Ltd., Eastleigh.
Handley Page (Reading), Ltd., Reading.
Helliwells, Ltd., Walsall.
Lancashire Aircraft Corpn., Ltd., Yeadon.
Marshalls' Flying School, Ltd., Cambridge.
Midland Aero Club, Elmdon.
Percival Aircraft, Ltd., Luton.
Portsmouth Aviation, Ltd., Portsmouth.
Reid & Sigrist, Ltd., Desford.
Rochester Flying Club, Rochester.
W. A. Rollason, Ltd. (Head Office), Terminal House, Grosvenor Gdns., S.W.1, and Croydon.
Scottish Aviation, Ltd., Prestwick.
Skyways, Ltd., Dunsfold.
Southend Corporation, Southend.
Tipsy Aircraft, Ltd. (Head Office), 20, Elmwood Avenue, Feltham, Middx., and Waltham.
Ulster Aviation, Ltd., Newtownards.
Warden Aviation & Engineering Co., Ltd., Old Warden, Biggleswade.
Western Airways, Ltd., Weston-super-Mare.
Wiltshire School of Flying, Ltd., Thruxton.
Wolverhampton Aero Club, Wolverhampton Airport.
Yorkshire Aeroplane Club, Sherburn-in-Elmet, Yorks.

Air Kruise (Kent), Ltd., Lympne.
Air Schools, Ltd., Derby and Wolverhampton.
Northern Air Charter, Ltd., Greatham.
Northern Air Charter, Ltd., Woolsington, Newcastle-upon-Tyne.
Plymouth & District Aero Club., Ltd., Roborough.
* South Coast Flying Club, Shoreham.
United Services Flying Club, Elstree.

Cowes Aero Club, Ltd., Cowes, I.o.W.
McDonald Aircraft, Ltd., Balado, Kinross.
T. Shipside, Ltd., Tollerton.
Westminster Airways, Ltd., Blackbushe.
Adie Aviation Ltd., Croydon.
Field Aircraft Services, Ltd., Bovingdon.
Manchester Aircraft Services, Ltd., Barton.
Wilks & Chandler, Eastleigh.
Exeter Aero Club, Exeter Airport.

* Approval limited to Monthly and Six-monthly Inspections.

Able Mable

Martin Mauler Carries Three Torpedoes and R.P.s

UNDER the title *A Ferocious Breed*, a survey of modern Naval single-seat strike aircraft appeared in *Flight* of January 6th. In this account, due reference was made to the Martin Mauler, as now in service with the U.S. Navy under the designation AM-1, but at the time the latest information on the capabilities of the type, summarized below, was not available.

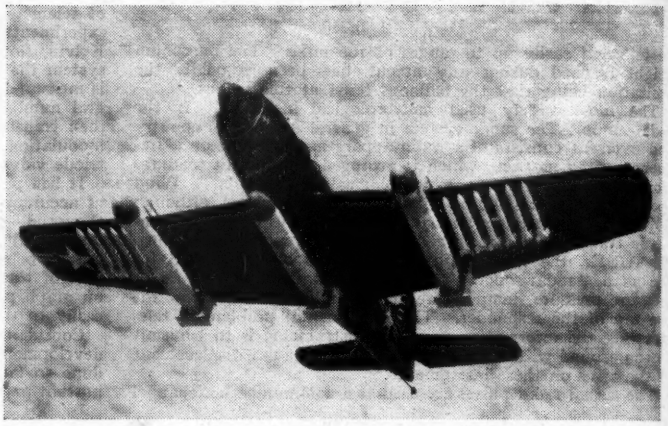
Now dubbed "Able Mable," by reason of the symbols "AM," the Mauler has lately flown, with a disposable load of 9,000 lb, at a gross weight of 25,000 lb, and has landed at a weight only slightly less. Armament comprised three torpedoes, each of 2,200 lb; twelve 5-in rocket projectiles; and four 20-mm guns. It has further been revealed that the Mauler, flying under maximum overload conditions, can operate at a gross weight of over 29,000 lb—a remarkable figure for a single-engined machine of only 50ft 1in span.

A maker's claim that the gross weight of the Mauler "is believed to be the heaviest ever flown by a single-engine aircraft" may sound unconvincing when much larger aircraft, such as the Vickers Wellesley, are remembered. Research shows, however, that even when tanked for their 7,162-mile world's record flight in 1938, Wellesleys weighed a mere 19,000 lb.

The pilot who flew the Mauler at 25,000 lb reported that take-off climb and control response (even at low speeds) were "pleasant and easy," and that landing was no problem.

About two thirds of 149 Maulers on order have already been delivered to the U.S. Navy. These have been fitted with four-blade Curtiss electric airscrews for their 3,000 h.p. Pratt and Whitney Wasp Major engines, but later machines of the series will have Hamilton Standards.

Optional external loads include A.S.V. radar and extra fuel tanks, giving a maximum range of over 2,000 miles.



Showing the disposition of the three 2,200-lb torpedoes and twelve 5-inch R.P.s on a Martin Mauler of the U.S. Navy.

Gliding in France

Subsidized Soaring : Opportunities for Youth

FRANCE resumed gliding when the war ended, at a disadvantage by comparison with Great Britain, which was just beginning to dissolve the most intensely developed, and, per head of population, the largest, of air forces.

It began, however, in a big way, during the short pre-austerity period when things were not done by half in the field of policies and subsidies. M. Tillon, the Air Minister, was very much in favour.

A fair amount of equipment had been brought back from Germany (where it was plentiful since gliding had become an important part of flying training—indeed, the young rocket-fighter pilots were entirely trained on sailplanes of progressively increasing wing loading). More equipment was designed and ordered, and a generous subsidy made gliding free at National Centres and Aero Clubs. All the necessary apparatus: high-performance, medium, and training aircraft; tugs and winches for launching, and the inevitable transport vehicles, were lent by the State to these responsible organizations.

Private ownership of a sailplane is not prohibited, but as there is no call for it, it simply does not exist.

There is no doubt that German influence and the insistence of the old Marechal on the building of a strong and disciplined youth are discernible in these large-scale measures. This, we hasten to say, is all to the good.

Immediate results were not in proportion to the national investment; the French are not as apt at doing things by numbers as the Germans. It may well be, also, that a thing given loses some of its value and arouses suspicion. Tillon went the way of all French Ministers; and it was fairly soon realized that the cost of gliding could not be entirely borne by the State. The subsidy was reduced, and it was decided that, although the equipment would still be provided free of charge, the running expenses should be borne by the club members.

A special government department, "Service de L'Aviation Legere et Sportive," controls gliding in addition to other nationally useful and sporting aspects of aviation. Thus the State has inevitably saddled itself with all sorts of additional responsibilities. It is accountable for the airworthiness of the materials used and the safety of the methods of instruction. Training of intructors is receiving much careful and intelligent consideration, the aim being a high and uniform standard. The accident record for 1948 is extremely good: only four people were killed, and in two cases the cause of the accident was definitely established as failure of the human frame in the air; soaring, in the words of our much-regretted Donald Greig, most delightful of occupations, can be very strong wine.

The National Soaring Centres and Gliding Clubs of France are spread all over its surface, sampling its natural riches: the thermal lift of the plains and the natural up currents of the mountains. In this respect there is much to discover and exploit in Scotland and in Wales, but individual efforts, hampered by restrictions and lack of funds, are puny and heart-breaking.

Cost of State-run Gliding

In spite of the share borne by the State, the price of gliding in France has increased steadily; and it is now more expensive to hire a government-owned sailplane than it is to fly a club machine in Britain. The hire of a single-seater high-performance machine is now 1,500 francs per hour. It must, however, be said at once that young men below the age of 21, and bona fide pilots who cannot afford these high charges, are allowed to fly at very much reduced rates. Also, the cost of staying at the hostel of a gliding centre is very reasonable, the maximum being 300 francs a day. Why should gliding in France, in spite of the fact that it is subsidized, be more expensive than it is here? The answer may well be that the government is such an impersonal owner that its goods are treated with less care. Also, once it has started to give there is no limit to what is expected from it, thus causing wastage. In this country gliding is done by a band of en-

GLIDING IN FRANCE

	1947	1948
Flying hours	39,900	62,050
Launches	235,000	477,568
Gliding Certificates		
"B"	1,803	2,054
"C"	949	970
Silver "C"	not available	248
Gold "C"	not available	10
Silver "C" Legs	965	1,548
Gold "C" Legs	23	58

Four international records were also broken.

GLIDING IN THE UNITED KINGDOM AND B.A.F.O.

	1947	1948
Flying hours	5,917	Not yet available
Launches...	46,715	Not yet available
Gliding Certificates		
"B"	604	640
"C"	341	424
Silver "C"	43	59
Gold "C"	1	1

It is doubtful if the number of hours flown this year will exceed 7,000.

thusiasts who, left entirely to their own devices, are putting much time and hard work into keeping its price down.

However, when the bulk of the results are considered, the French system, in spite of its drawbacks (which, although they appear to be inherent in human nature, can, with care, be minimized) is fully justified. Not only have the French done a lot more gliding and soaring at all the levels of the art than we have, but many young men, who could not afford to pay for it, have been trained. At their National Championships this year men in their early twenties were prominent. At the F.A.I. Competition in Switzerland this year our excellent and tragic national team were compared by a Swiss paper to a select group of Oxford Dons. They were men who had made gliding in England before the war and had also the task of resuscitating it unaided afterwards. The bulk of our Silver "C"s for this year are men who were at it ten years ago and have now taken advantage of the improved equipment available, at a price, to clear up arrears. They had earned or come by enough money to win the coveted badge. Unless some help is forthcoming I would not be surprised to see us winning fewer silver badges this year than the last.

With our genius for compromise, can we not combine our present efficiency in the running of gliding clubs with a scheme which would make this king of sports available to the deserving public?—JACQUES COCHEMÉ.

The Women's Royal Air Force

Conditions Under Which Women Serve with the R.A.F. Outlined by Air Commandant Hanbury

AN official statement announcing the introduction, on February 1st, of the title "Women's Royal Air Force" to describe collectively women serving with the Royal Air Force, was published in the previous issue of *Flight*. The conditions now governing such service were outlined last week by Air Commandant Felicity Hanbury, Director of the W.R.A.F., and are summarized below.

The Air Commandant recalled that in May, 1946, the Government announced that the women's forces would be continued on a voluntary basis as a permanent element of the Armed Forces of the Crown, and in accordance with their decision the Air Council decided that the W.A.A.F. should be incorporated in the R.A.F. and follow the pattern of that force as regards duties and trades. The institution of this regular force had to be delayed pending the necessary legislation to establish the force on a legal basis, and therefore an interim scheme of extended service was introduced to bridge the gap between the wartime and the peacetime services. Meanwhile discussions were going on to reach agreement on the legal measures required and also on the conditions of service. This has now been provided by the Army and Air Force Women's Service Act, 1948, and the broad effect of this is that women may be commissioned and enlisted in the Royal Air Force and also in its reserves and auxiliary forces. Women officers and airwomen will be fully integrated into the R.A.F. and will not be organized as a separate corps or body, though His Majesty has approved the title of "Women's Royal Air Force" to be used to describe the women serving in the R.A.F. Members of the W.A.A.F. do, in fact, serve side by side with men and not as members of a separate organization.

It follows as a corollary that women officers should have the same powers of command as men, allowing for their non-combatant status; officers of the W.R.A.F. will have inherent powers of command as Royal Air Force officers. "I, personally, am confident that the same qualities of tact and good sense which led to their success in their former status will ensure the smooth working of this new arrangement," Air Commandant Hanbury said.

Women will be subject to trial by courts martial, but will always be brought before a woman subordinate commander in the first instance. A court martial held for the trial of a woman accused will invariably include at least one woman member and a woman may be president of a court. The Air Commandant said that detention will, in time, be carried out, and that the matter was being discussed in conjunction with the Home Office.

Women will be in the same position as their male fellow members of the R.A.F. both as regards their duty to salute all superior officers of the Royal Air Force, male and female, and as regards the right of women officers to be saluted by their juniors in the R.A.F., male and female—previously a matter of courtesy. Members of the W.R.A.F. will receive three-quarters of the men's pay rates but only two-thirds of the pension rates, with the hope of improvement as and when the Government decide to implement their accepted policy of equal pay for equal work. Allowances in lieu of rations or accommodation are to remain the same as the rates for men.

It is intended to introduce as soon as possible a scheme whereby young women with a good educational standard will be able to join the W.R.A.F. with a view to training for commissioned rank. They would do recruit training as airwomen and then go on for their professional and O.C.T.U. training as cadets. If successful they would be commissioned and if unsuccessful they would be granted their discharge if they wished to take it. Pending the introduction of this scheme, the recruit with potential officer qualifications will have her paper marked to that effect and will be kept under observation.

Matters concerning the health and moral conduct of women which, by reason of their specifically feminine aspect, are not suitable for administration through normal R.A.F. channels, are dealt with by women officers.

Conditions for Married Women

Married women will be accepted for service provided they have no children under the age of 15 for whom they are legally responsible, and a married woman must also prove that her family circumstances are such as will not interfere with her full mobility throughout the period of her service. If an airwoman marries during her service she may be discharged if she so desires, provided her application is made within three months after the date of marriage. Airwomen accept obligations to serve in any part of the world (they are at present serving in the Far East, Middle East and Germany), to fly when required to, and to be subject to the Air Force Act so far as it may be applied to women.

All women now serving will be accepted in the Royal Air Force for the remaining period of their present appointment or engagement, but it is hoped that the majority will undertake periods of further service. For airwomen who prolong their service special benefits have been proposed in the form of an immediate payment of transfer grant and a period of re-engagement leave. Officers will gain by an increase in their present rate of gratuity, but details of these special benefits have not been published.

NAVIGATION AID EQUIPMENT FOR HELICOPTERS

SIR CYRIL F. ENTWHISTLE, K.C., M.C., Chairman of Decca Record Co., Ltd., presided at the Annual General Meeting of the company, which was held on January 20th in London. The Chairman spoke of the value of the Decca navigator system for both hydrographical and aerial survey work and announced that the R.A.F. squadron engaged on the survey of the whole of Great Britain was using the equipment. Results already obtained have proved that its use is instrumental in effecting considerable saving, not only in the time of operations, but in the cost and time of translating the results of photographs taken.

Particularly interesting is the development of the system for helicopters which has been used by B.E.A. on their experimental postal delivery service in East Anglia. Successful experiments were made with the track approach system and development work is now in hand to finalize this equipment in accordance with B.E.A.'s requirements. Sir Cyril was in no doubt as to the future of the Decca system in the helicopter field, for he said it not only had the advantage of operating at any altitude from the moment the aircraft became airborne to the time of its return but also, due to its ease of reading, the service of a navigator could be dispensed with. The major technical development work of the year had been to solve the problem of "lane identification."

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

MANNING THE R.A.F.

Luxury for All

I SHOULD like very much to add my views to the others that have been raised concerning the manning of the R.A.F.

I have had many recent discussions with ex-R.A.F. personnel, and have definitely crystallized an opinion which has been formulating in the back of my mind for many years, years which include six as airman ground crew, three years as officer aircrew (flying-boat pilot) and, since my demobilization, three years of civilian life. This opinion is that the chief curse of the R.A.F. (and probably the other Services as well) is the "officer complex," a complex which is chiefly created by the difference in the standard of living between officers and other ranks.

Now, I want to make it quite clear I do not mean that everybody should get the same rate of pay, nor do I mean that everybody should mess together, but what I do mean is that I see no reason why commissioned ranks only should live the privileged life that they do. They have superior messing, superior comfort, very often with their own room or a room shared only between two or three. They have complete freedom from the inane system of booking in and out of the guard room, and privacy if they want it.

Also, I cannot see why commissioned ranks should get such elevated allowances when they are deprived of these comforts when serving in the field. Some of these privileges given to officers are most unfair. When I was at Old Sarum at the beginning of 1939, I can remember how the best pub in Salisbury was out of bounds to other ranks, and the unfairest differences of them all was to be found on board the troopship. Even now, some ten years after, my blood rises when I think of the misery of my journey to Egypt as a troop deck mess orderly, compared with the superb luxury in which the officers lived.

No doubt all these points have had their effect on present-day recruiting. If any of them could be substantially justified, then there is some excuse for retaining them, but one cannot really justify them on the grounds that it is necessary to create privilege as a substitution for leadership in order to make officers respected and their orders obeyed. Of all the fallacies that I have ever heard, the latter is by far the biggest and by far the most widely used. There is no substitution for leadership, and in any case a real leader would also be prepared to suffer even greater hardships than his men and expect no superior reward.

The argument may be advanced that officers pay well for their superior living. That may be so, but a great number of airmen would be only too glad to pay for the same standard if they were given the same opportunities.

Here I would like to have a word about the term "discipline." I should define discipline chiefly as the will to do one's duty to the best of one's ability, and I think that one's early education in the Service ought to be primarily devoted to learning what one's duty is and, the most efficient way that it can be performed.

Air Chief Marshal Sir Philip Joubert has stated that, in his opinion, more and not less discipline is what is wanted. If he means what I mean by discipline, then I entirely agree with him, but if he means things like kit inspection, parades and such-like, then I do not agree with him, for these reasons:—

Even if the Air Council does not recognize the principle of equality in living standards, there are some things that they must recognize with regard to the average man, be he Serviceman or civilian; that he washes and keeps himself as clean as circumstances will allow; that he regards such things as F.F.I.s and kit inspection as the most degrading of all the indignities that he has to suffer. Quite frequently the square-bashing parades that all airmen are called upon to attend with frequency fills them with a sense of great indignity, especially the intelligent airman who is usually subject to a greater degree of sensitivity; and don't forget it is the intelligent airmen that the Service is trying to attract.

Therefore I hope that when people discuss whether the Service requires more or less discipline, they think quite clearly about what they mean. Let them resist the temptation of heaping even further indignity upon the airmen in the name of "discipline."

To sum up I would say that the best means of encouraging recruiting would be for the Air Council to announce this three-point programme:—

(1) That all the usual indignities that airmen have to suffer (i.e., booking in and out of guard room, F.F.I.s, etc.) will be sought out and abolished. These alone would release quite a lot of manpower in the way of S.P.s, etc.

(2) The standard of living of all ranks should be made equal.

(3) That the Air Council recognize that every man in the Service, commissioned or otherwise, is an individual.

Cheltenham, Glos. D. V. JENKINS.

JET PROPULSION

Recoil Not Really Descriptive

READING L. Hollis's letter in your January 20th issue, I note with interest his determination to install the word "recoil" in preference to "reaction."

I personally may be a die-hard, but can see little point in recoil at all. In one of the original jet engines—the Welland W2B, the so-called recoil could be seen by the "bend-assembly." But as time progressed, and jets changed their shape but not their principles, it could be seen in the Derwent that the possibility of recoil became less, mainly due to the absence of the "bend-assembly."

The explanation given of the shot exploding in the tube was good—but we cannot consider a "closed" flame tube when gases pass through it. The idea of recoil would be rather misleading, as many people are under the impression that recoil is obtained from the velocity of the gases pushing against a "solid" wall of air at the jet pipe orifice. This is not so, as a jet will work in a depression providing air is supplied for burning.

So, surely we can base our assumption on the fact that our reaction is obtained from the amount of air that can be discharged, coupled of course, with the amount of air drawn in. The moving of the engine can be explained by the reaction of gases acting, firstly, on the slight slope of the flame tubes—right down to the propelling nozzle; these are known as "positive" thrusts. Obviously, we must have some pushing the opposite way, and these are known as "negative" thrusts. Due to shape and construction, the positive will always overcome negative thrusts. So with a consistent overpowering positive thrust the engine will decidedly move.

Another simple explanation is a balloon which has been blown up and released. Its movement depends solely on the escaping air and the reaction inside the balloon—Newton's third law of motion on which all jet propulsion is based: "To every action there is an equal and opposite reaction."

J. CROWDY.

Propulsion by Reaction

MR. L. HOLLIS (see letter in issue of January 20th) evidently does not appreciate that the word "reaction" in connection with jet propulsion is used in the sense in which Newton used it when he said: "To every action there is an equal and opposite reaction." The 10-lb weight on the table acts downwards on the table with a force of 10lb, but the table reacts upwards on the weight with an equal force. The small boy at the seaside who heaves a heavy piece of rock away from him and falls over backwards in the process has learnt that rock reacts on him in the same way that he acts on the rock. No question of medium arises there.

Imagine a man standing on a trolley in a corridor along which runs a shelf lined with cannon balls. The man takes a cannon ball and throws it away over the rear of the trolley. The reaction of the cannon ball on the man causes him and the trolley to move forwards. He continues to take cannon balls from the shelf and throw them over the rear of the trolley, and the trolley trundles merrily down the corridor. For the balls being taken from the shelf, substitute air entering the air intake; for the man, substitute the jet engine; for the cannon balls being thrown away, substitute the hot gases being ejected from the outlet; for the trolley, substitute the aircraft.

The recoil experienced by a gun is evidence of the reaction on the gun of the force necessary to eject the gases and the projectile from the barrel. The word "recoil" implies a discontinuous process, however, and "reaction" is the better word to use in connection with jet engines. Mr. Hollis' analogy

Correspondence . . . . . .

is not a correct one, however. The bomb forcing the closed end of the tube away from it is an example of action, not reaction. To make the process continuous the bomb has to be attached to the object which it is blowing away, and we get something very similar to standing in a basket and picking oneself up by the handles. No, Mr. Hollis, it is the gases leaving the open end of the tube which make it move along.

London, N.4. L. G. BROOKES.

ALTIMETER SETTINGS

Q.N.H.—Why ? Echo Answers " Why ? "

YOUR correspondent " 5055 " (13/1/49) seems to be quite justified in his criticism of the article " Altimeter Settings " (*Flight*, December 16th, 1948). Wing Commander Shelfoon could hardly have made out a better case for retaining the Q.F.E., which has stood us all in good stead in fair weather or foul, particularly the latter, for the last fifteen years or so.

To take remarks out of their context is always difficult, and not very fair to the author, but let us try to take as many representative points as possible.

From Wing Commander Shelfoon's list of definitions, it will be seen that Q.N.H. is the same as a Q.F.F., but not so accurate. A Q.F.E., of course, is the most accurate of all.

The writer complains about the number of existing altimeter settings, and promptly introduces a new one—the Q.N.H. There follows the astounded pupil who thinks, poor chap, that an altimeter should read zero when the aircraft is on the ground!

Then comes the astonishing suggestion that the Q.F.E. is responsible for accidents which occur due to flying into high ground. This could only be true if the aircraft had taken off from an airfield below sea level (and how many of them are there?) or had unwittingly flown into an area of very low pressure; in which case, whatever datum the pilot was using would produce the same result.

The argument that on a cross-country flight a Q.F.E. results in a big altimeter adjustment, with the consequent chance of error, is ruled out by the fact that the landing forecast issued by the station of departure would, or should, include the Q.F.E.

The general question of cross-country flights is very well taken care of by Regional Q.F.F.s.

The point which seems to have been overlooked is that the Q.F.E. gives a pilot on the circuit a safety factor over the surrounding terrain, whereas a Q.N.H. does not.

Says Wing Commander Shelfoon: " the advantages of the Standard Setting are many," but the only one which is obvious to the reader is that all aircraft in a given area have their altimeters synchronized. But then, so they have if using Regional Q.F.F.s. He goes on " the disadvantages . . . amount to the additional mental effort required," etc.

Now, if there is one thing a pilot can manage without on an instrument approach, it is any additional mental effort. His powers of concentration are fully occupied without the addition of any mental arithmetic.

Let us study the writer's objections to the Q.F.E.:—

a. " It cannot . . . be satisfactory for any flight procedure except the approach "; which, oddly enough, is what the Q.F.E. was designed for.

b. " It requires adjustments, sometimes large, at the most inconvenient time." We have seen that these adjustments need never be large, and that it is easier to adjust the instrument so that you can read your height above the airfield direct than to carry an arbitrary figure in your head—a figure which is different for each airfield you visit.

c. " At the higher airfields . . . it induces an almost intolerable lack of correlation of indicated height and actual height." Does it matter? When the altimeter reads zero, the aircraft is level with the runway. In any case, if the airfield is a really high one, and I.C.A.N. conditions do not prevail, your Q.N.H. is bound to be fairly inaccurate. With a Q.F.E., on the other hand, the pilot has the exact barometric pressure on the airfield and there is no room for confusion.

The Q.N.H. must surely be a piece of Empire building to end all Empire building, and the writer finishes with a plea for greater realism. Apart from ignoring this desirable quality, the article abounds in arguments full of holes, through which you could taxi the Brabazon.

Wing Commander Shelfoon has apparently sold his idea to the Air Ministry and to the Ministry of Civil Aviation, but to the question " Altimeter settings, Q.N.H.—why? " posterity will almost certainly echo " Why? "

JOHN SCOTT.

Braunston, Nr. Rugby.

[*Correspondents appear to have overlooked the paragraph published on p. 782 of " Flight," December 30th, 1948, in which it was explained that Regional Q.F.E. is used for flights above 3,000ft in Flight Information Regions, and above 1,500ft in Control Zones.*—ED.]

" TWINS " ON THE BERLIN AIRLIFT

IN your issue of January 27th you publish two letters protesting about our recent advertisement relating to the use of the Bristol Freighter on the Berlin Airlift, which said that the Freighter was the only twin-engined aircraft on the lift, and further, the only aircraft being consistently back-loaded.

The protests are, of course, well justified, and we wish to apologize to all concerned for a most regrettable error. You and your readers will appreciate that the advertisement was based in complete good faith on information from a usually reliable source whose accuracy we had, therefore, no occasion to question. When we discovered the error it was, unfortunately, too late to withdraw the advertisement before it appeared.

It goes without saying, we hope, that we intended no slight on those engaged in the Airlift whatever aircraft they may be operating, for whose grand work we, like everybody else in England, have the greatest admiration. If we inadvertently over-stated our share in " Operation Plain Fare," may we atone by " Operation Humble Pie "?

R. H. H. MACAULAY,
The Bristol Aeroplane Co., Ltd. Public Relations Officer.

FORTHCOMING EVENTS

Feb. 3rd.—R.Ae.S. (Graduates' and Students' Section) " Notes on Fighter Development 1936–1948," Jeffrey K. Quill, O.B.E., A.F.C.
Feb. 3rd.—R.Ae.S. (Isle of Wight) " The Probable Role and Influence of Aircraft in Future Warfare," Air Marshal Sir Robert Saundby, K.B.E., C.B., M.C., D.F.C., A.F.C.
Feb. 5th.—Air Scout Movement: Exhibition at Holloway Baptist Church.
Feb. 9th.—R.Ae.S. (Leicester) " Airscrews," E. Danvers.
Feb. 9th.—R.Ae.S. (Southampton) " Radio Aids," F. R. Wills.
Feb. 9th.—Royal United Services Institution: " Land/Air Warfare," Air Vice-Marshal W. L. Dawson, C.B., C.B.E.
Feb. 9th.—R.Ae.S. (Weybridge): " Civil Air Transport," P. G. Masefield, M.A., F.R.Ae.S.
Feb. 10th.—Royal Aeronautical Society: The Second Louis Blériot Lecture: " French Practical Aerodynamic Methods," Monsieur Brocard and Monsieur Hussenot.
Feb. 11th.—Institute of Transport (Chelmsford): " The Future of British Internal Air Services," J. F. Parke.
Feb. 11th.—R.Ae.S. (Portsmouth) Short Papers by members of the Branch.
Feb. 11th.—Guild of Air Pilots and Navigators, and Air League of the British Empire: Ball in aid of the Guild's Benevolent Fund and the Air League's Young Pilots' Fund.
Feb. 12th.—Rugby Football Twickenham, Royal Navy *versus* Royal Air Force.
Feb. 12th.—British Interplanetary Society: " The Design of Liquid-Propellant Rocket Motors," J. Humphries, B.Sc., G.I. Mech.E.
Feb. 14th.—The Institute of Transport: The Brancker Memorial Lecture " Off the Record: The Influence of Records on Air Transport," Major R. H. Mayo, O.B.E., M.Inst.T.
Feb. 14th.—R.Ae.S. (Derby) " Pictures in the Air," C. E. Brown, F.I.B.P., A.R.P.S.
Feb. 15th.—Londonderry House: Films: " Pacific Air Route," W. Courtenay, M. M.
Feb. 16th.—R.Ae.S. (Brough): " Jet Engines," W. T. Winter.
Feb. 16th.—R.Ae.S. (Preston): " The Propeller-Turbine Aero-Engine," F. H. Owner, M.Sc., F.R.Ae.S., M.S.A.E.
Feb. 16th.—R.Ae.S. (Gloucester and Cheltenham) " The Design of an Aeroplane," Prof. R. L. Lickley, B.Sc., D.I.C., F.R.Ae.S. At Cheltenham.
Feb. 16th.—R.Ae.S. (Hatfield) " The Probable Role and Influence of Aircraft in Future Warfare," Air Marshal Sir Robert Saundby, K.B.E., C.B., M.C., D.F.C., A.F.C.
Feb. 17th.—Royal Aeronautical Society: " Planned Servicing in the Royal Air Force," S/L. E. A. Harrop, O.B.E., A.F.R.Ae.S.
Feb. 17th.—R.Ae.S. (Coventry) " The London-Sydney Air Route," C. H. Jackson.
Feb. 18th.—Institute of Navigation: " Operational Aspects of Marine Radar." A Symposium of Papers. Chairman: Sir Robert Watson-Watt, C.B., F.R.S.
Feb. 22nd.—R.Ae.S. (Belfast): Lecturettes and Informal Discussion.
Feb. 24th.—R.Ae.S. (Manchester) " The Development of the Mamba Engine," A. S. Lindsey, M.A., A.F.R.Ae.S.
Feb. 24th.—Royal Aeronautical Society: " Flutter and Stability," Prof. W. J. Duncan, B.Sc., F.R.Ae.S., M.I.Mech.E., F.R.S.
Feb. 24th.—R.Ae.S. (Isle of Wight) " Naval Aircraft," Lt. Cdr. E. M. Brown, O.B.E., D.F.C., M.A., A.F.R.Ae.S.
Feb. 26th.—Society of Licensed Aircraft Engineers South Eastern Area Lecture. " Airframe Repairs," G. C. Banks, Manson House, 26, Portland Place, London, W.1., at 3 p.m.
Feb. 26th.—Helicopter Association of Gt. Britain: " Helicopter Transmission Systems," K. Watson, A.R.Ae.S.
Feb. 28th.—Institute of Public Administration: " The British Overseas Airways Corporation," J. O. Blair-Cunynghame.
Mar. 2nd.—R.Ae.S. (Luton) " Evolution of a Modern Aeroplane," Prof. R. L. Lickley, B.Sc., D.I.C., F.R.Ae.S.

Royal Air Force and Naval Aviation

News and Announcements

SERVICE AVIATION

***STREET PHOTOGRAPHER:** R.A.F. aircraft have recently photographed 50 square miles of London to assist the Ordnance Survey in compiling 50 inch-to-the-mile maps of the city. One of the machines engaged, this Anson displays its three-camera installation.*

Sir Bertram Rumble

THE death has occurred, at the age of 73, of Sir Bertram Rumble, honorary treasurer of the R.A.F. Benevolent Fund, and honorary secretary of the appeals committee of the fund since 1941. Lord Riverdale, chairman of the council, writes that Sir Bertram's staunch friendships and his devotion to the cause he was serving entitled him to the highest praise.

Berlin Record

TRANSPORT Command aircraft flew 1,014 short tons into Berlin during the 24 hours ending mid-day Sunday, January 23rd—the highest R.A.F. air lift tonnage for the winter. They also flew out 473 passengers, 69 tons of mail and 16 tons of freight.

British civil aircraft flew in 527 short tons during the same 24-hour period, made up of freight, petrol and diesel oil. The previous R.A.F. record figure was during the summer when 1,048 long tons were flown into Berlin on September 19th.

Air Lift Congratulations

FOLLOWING his recent visit to Germany, the Chief of Air Staff, Marshal of the Royal Air Force Lord Tedder, sent messages to the Air Officers Commanding B.A.F.O. (Air Marshal T. M. Williams), and Transport Command (Air Marshal Sir Brian Baker), expressing his congratulations to all ranks engaged in the Berlin air lift.

To the British Air Forces of Occupation, the C.A.S. said: "I have returned from Germany with many vivid impressions of the precision with which the R.A.F. is getting on with the job. Such precision through every second of the day and night is vital for the operation of the air lift, and it would meet with public acclamation if carried out in a spectacular parade in a vast arena. All of you engaged on the air lift—both aircrew and ground staff, both Service and civil—are living by stop-watch, and the comparatively short hauls involved little opportunity of regaining valuable seconds once they are lost."

In his message to Transport Command he referred to the "drastic test of efficiency, discipline and morale" imposed by the air lift on the R.A.F. in general, and the Command in particular. That test was being passed with flying colours, and Transport Command had added honour to its record unsurpassed even during the war. In co-operation with B.A.F.O., the Command was writing a glorious page in the history, not only of the Royal Air Force, but also of the world. "Seeing that job done," said Lord Tedder, "has made me more than ever proud to be a member of a Service that, in the face of so many difficulties, has achieved so great a miracle." The message concluded: "Operation *Plainfare* has thrown a spotlight on what the Royal Air Force *can* do, and I am sure I am voicing the general feeling in our Service in giving the verdict—good show, Transport Command and B.A.F.O."

R.A.F. Boxing

THE R.A.F. Boxing Association will stage its first Officers' home fixture against the Royal Navy and Royal Marines since the war at R.A.F. Station Hullavington, Wilts, on Friday, February 4th, at 8 p.m., in a hangar seating about 2,500. The Duke of Beaufort will present the prizes.

The following have been selected to represent the R.A.F.: *Featherweight:* F/O. J. A. N. Davies (Hemswell); F/L. W. C. Sinclair (Halton). *Lightweight:* W/C. F. M. Thomas (Old Sarum); F/L. B. M. Brown (H.Q. 41 Group). *Welterweight:* F/L. J. Pugh (Wyton); F/O. E. Rutter (Little Rissington); F/L. H. J. Smith (Upper Heyford). *Middleweight:* S/L. A. F. Simmons (Mildenhall); F/L. L. Ross (Stafford). *Light Heavyweight:* F/L. Shelly (B.A.F.O.); P/O. S. Hawkins (Abingdon). *Heavyweight:* F/L. R. Stirling (Norton Disney); S/L. J. Midwood (H.Q., N. Ireland). *Reserves:* F/L. Cawthorne (St. Athan); F/L. Crozier (Boscombe Down); F/L. Blaszak (St. Athan).

R.F.C. and R.N.A.S. Reunion

NO more tickets are left for the reunion party, at Londonderry House on March 31st, of those who served in the R.F.C. and R.N.A.S. A few tickets, if any are returned, will be kept for some of those now abroad, who may be able to return in time for the reunion. Marshal of the R.A.F. Viscount Trenchard of Wolfeton will be joined in receiving the guests by Marshal of the R.A.F. Sir John Salmond, Air Chief Marshal Sir Robert Brooke-Popham, Air Chief Marshal Sir Arthur Longmore, A.V-M Sir Phillip Game, and Vice-Admiral R. Bell Davies, V.C. Certain other officers of the R.F.C. and R.N.A.S. have been invited to join in this reception, but have not yet replied. Lord Trenchard will propose the loyal toast. Lord Tedder, who served in the R.F.C., will speak on behalf of the present-day R.A.F.

The reunion promises to be a great gathering of pioneers, and many famous pilots of the past have bought tickets. A Guard of Honour will be mounted by cadets of No. 291 (Chelsea and Westminster) Squadron, A.T.C., in whose recruiting area is Londonderry House.

R.A.F. Appointments

APPOINTMENTS have been announced for three officers of air rank who spent last year at the Imperial Defence College. A.V-M. C. H. Sharp, D.S.O., A.F.C., became A.O.C. No. 38 Group, Transport Command, on January 17th, and in this capacity attended the Brize Norton air ambulance demonstration described in *Flight* of January 27th. Before going to the Imperial Defence College, A.V-M. Sharp was the representative of the Air Council Member for Supply and Organization on the Air Ministry Manpower Economy Committee, to which he went early in 1947, after more than a year as Director of Accident Prevention. He was appointed Deputy Chief of Staff of the 8th U.S. Army Air Force in 1943 and given Command of No. 54 (Pathfinder) Base, R.A.F. Bomber Command, early in 1944; later in the same year he was appointed Air Officer in Charge of Administration, Base Air Forces, South-East Asia. In April, 1945, he was given a similar post with "Tiger Force," which would have gone into operation against Japan but for the Japanese surrender.

Also at the Defence College last year, A. Cdre. D. Macfadyen, C.B.E., and A. Cdre. H. D. Jackman, C.B., C.B.E.,

Service Aviation . . . . .

have both been appointed to the Air Ministry, A. Cdre. Macfadyen as Director of Plans, and A. Cdre. Jackman as Director of Organization (Forecasting and Planning).

Auxiliary Appointment

FLIGHT LIEUTENANT R. COLLIER is to command No. 2609 (West Riding) Light Anti-Aircraft Squadron of the Royal Auxiliary Air Force, located at R.A.F. Yeadon, near Leeds. A pre-war member of the R.A.F.V.R., F/L. Collier served with the R.A.F. on gunnery duties from the outbreak of war until 1945. He was commissioned in the R.A.F. Regiment in 1943.

R.A.F.V.R. Expansion

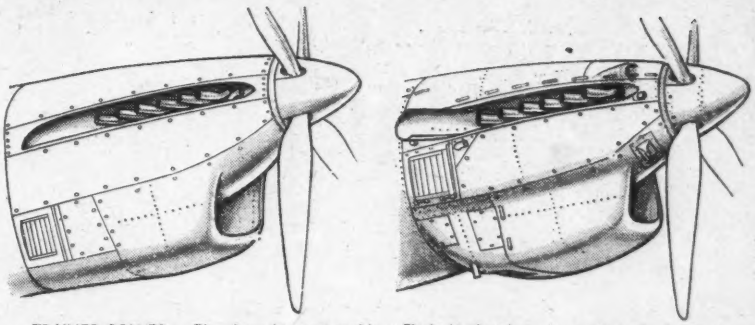
DUNDEE is to have a Reserve Centre for the R.A.F. Volunteer Reserve, with accommodation for 500 members. Its associated Reserve Flying School will be No. 11 R.F.S. at Scone, Perth. Six more centres are in the planning stage and eleven sites are now being examined in the following areas: Exeter, Oxford, Ipswich, Leeds, Gloucester (or Cheltenham) and Brighton.

No. 2 Group Re-formed

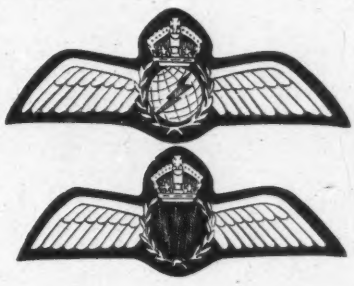
ONE of the R.A.F.'s most famous wartime operational groups, No. 2 Light Bomber Group, disbanded 18 months ago, has been re-formed in the British Zone of Germany under the command of A.Cdre. L. F. Sinclair, G.C., C.B., C.B.E., D.S.O., A.D.C., and from its headquarters at Sundern, near Gutersloh, will take over control of all the operational squadrons in Germany. The decision to re-form the Group was made partly to relieve the increased pressure which unforeseen commitments placed upon H.Q., British Air Forces of Occupation, and partly as a means of strengthening the position of the R.A.F. in Germany. In selecting No. 2 Group for revival to control zonal patrols, manœuvres and exercises, B.A.F.O. could not have made a more popular choice, for this Group, which was formed a few days before the outbreak of the last war, played an outstanding role during the war years.

On September 3rd, 1939, a Blenheim pilot from 2 Group took off on the first operational sortie, and earned the first D.F.C. to be awarded, in the second world war. The Group sent the first bomber over Berlin in June, 1940; bombed the German invasion barges lying in the Channel ports; attacked the *Scharnhorst, Gneisenau* and *Prinz Eugen* in their dash through the English Channel; supported the Commandos at the Dieppe landings; and bombed Gestapo headquarters and saboteur schools. Other highlights of its history were the breaching of the Amiens prison to release hundreds of political prisoners and hostages (an operation from which the heroic G/C. P. Pickard, D.S.O., D.F.C., never returned), and the attack on Bremen, for which W/C. H. I. Edwards was awarded the Victoria Cross.

One of the wartime commanders of the Group was A.V-M. Sir Basil Embry, who is to become A.O.C.-in-C., Fighter Command, in April. A.Cdre. Sinclair, the new A.O.C., commanded the Tactical Light Bomber Force in the Middle East and North Africa in 1943-44 and was afterwards Senior Air Staff Officer, Balkan Air Force. He was commissioned from Cranwell in 1928.



TRAINER POWER: *The directly comparable "Flight" sketches above show that radiator outlines are a useful aid to distinguishing between the Merlin 35-powered Avro Athena 2 (left) and Boulton Paul Balliol 2 advanced trainers. An "in the air" assessment of the Balliol 1's handling qualities appears in this issue.*



FULLY FEATHERED: *"Half-wing" emblems are no longer to be awarded to Royal Canadian Air Force aircrews. Shown above are the recently approved badges for radio navigators (top) and radio officers.*

New R.A.F. Branch

AN Airfield Construction branch has now been set up in the R.A.F. and offers short service commissions of five years as civil engineer officers and plant officers. Terminal gratuity will be at the rate of £100 for each completed year of service. Plant officers will have opportunities to extend their commissions up to ten years and civil engineers will be considered for careers in the Air Ministry Works Directorate at the end of their commissioned service. Full details and application forms are obtainable from Air Ministry (A.R.1), Kingsway, London, W.C.2.

R.A.F. Permanent Commissions

GENERAL DUTIES BRANCH

Wing Commander: E. P. M. Fernbank, D.F.C.

Squadron Leaders: A. Bruce, D. J. Callinham, A.F.C., W. R. Dibb, A.F.C., H. R. Edge, A.F.C., H. Grant, P. E. L. Halle, R. J. Harrison, A. J. Hereford, M.B.E., A. M. Johnstone, B. V. Kerwin, J. G. Mann, A.F.C., F. A. Pentycross, J. M. Ritchie, T. N. Silk, F. V. Thomas, J. A. Thomson, F. Welburn G. Wright.

Flight Lieutenants: C. J. Anderson, D.F.C., E. A. Brittain, T. W. Brown, C. Y. Buckley, R. Burns, C. A. Butterworth, D. J. Carruthers, V. G. S. Casley, G. S. Chalmers, R. M. Chisholm, E. J. Clelland, R. J. Cole, A.F.C., D Cooke, J. D. P. Cotter D.F.C., H. G. Cousins, A. Craig, T. S. Curtis, D. H. Davy, F. Easley, N. T. Evans, A.F.C., F. Eyres, J. J. Fisher, D. R. Goodwin, W. L. Green, D.F.C., L. E. A. Hacke, M. W. Hale, R. Hemstock, R. T. Howard, A.F.C., B. V. Hunter, P. G. Hyson, A. J. Jacomb-Hood, D.F.C., G. E. Jones, J. T. Lilleystone, R. Lingard, D.F.C., B. W. Lofthouse, W. McClymont, P. P. McGuinness, D.F.C., J. B. Marshall, E. D. Martin, D.F.M., J. R. Maulden, P. F. Morfill, D.F.M., R. E. Morley, D.F.C., T. M. Ormiston, D.F.C., S. E. Pattinson D.F.C., J. C. Pearson, I. L. H. Ramage, D.F.M., R. G. Ravenscroft, A. E Richmond, D. R

BOSCOMBE ENTERTAINS: *Cheerful moment during a recent function at R.A.F. Station Boscombe Down, showing (l. to r.) A. Cdre. H. L. Patch (Air Officer Commanding the station) and Mrs. Patch, Lt.-Gen. Sir John and Lady Harding, and Air Marshal Sir Arthur and Lady Sanders.*

Service Aviation . . . . .

Scott, D.F.C., D. I. Slade, A. V. S. Smith, J. W. S. Smith, M.B.E., D.F.C., B. J. Spragg, D.F.C., W. J. Stacey, R. Stansfield, G. Stephenson, D. A. Stevenson, L. A. P. Tapp, D.F.C., H. H. Thompson, G. H. C. Threlfall, S. L. Tunstall, J. M. S. Vaux, C. E. Vince, D.F.M., E. T. Walter, R. D. Walton, D.F.C., W. J. A. White, K. M. Wickson, R. K. Wilson, A. F. Wimsett, D.F.C., C. R. Winter, D.F.C., L. F. Wolsey.

Flying Officers: W. E. Baker, D.F.C., J. G. G. Beddoes, E. J. Clarke, S. A. Craigie, D.F.C., C. B. Elsdon, D.F.M., R. C. Evans, I. P. W. Hawkins, M. E. Hobson, G. Jukes, A.F.C., I Ladley, W. I. Macauley, F. Mandeville, J. C. Marmion, A. Platts, R. E. Shreeve, C. R. C. Spencer, F. Stillwell.

TECHNICAL BRANCH.

Wing Commanders: C. A. Denne, E. Wood.

Squadron Leaders: E. F. Hancock, B.E.M., G. S. Morris, O.B.E., L. W. Percival, M.B.E.

Flight Lieutenants: A. F. H. Barber, C. Bruce, J. R. G. Cakebread, D.F.C., F. W. Carter, R. G. Chapman, E. W. Cotton, C. Cruickshank, C. W. Earnshaw, D.F.C., L. E. Francis, G. A. M. Gallop, D.F.C., L. W. Gayler, R. C. Hazell, J. E. E. Hodson, C. O. Hook, J. Jordan, R. Kirby, K. R. Makin, D.F.C., S. Morgan, E. J. L. Robb, W. A. Spacey, G. E. Thomas.

Flying Officers: H. J. Granger, G. C. W. Monk, D. J. Reilly, K. R. Yexley.

EQUIPMENT BRANCH.

Flight Lieutenants: W. Beeton, H. C. Brownrigg, E. Gorman, J. C. T. Price.

Flying Officers: G. Booth, D. Botwright, A. S. Isaac, C. Martindale, C. E. Norman, E. Toole.

Pilot Officers: P. J. Probyn, R. Sykes.

SECRETARIAL BRANCH.

Squadron Leaders: L. Bond, W. C. Putt, J. M. Rickard, A. West, A.F.M.

Flight Lieutenants: E. Cornish L. R. Gould, D.F.M., J. L. Sharp, D.F.C., A.F.C., S. W. Timmis, B. Wilkinson.

Flying Officers: W G. S. Austin, C. S. Clark, D. Cotsell L. W. Denning, M. S. Harris, W. H. Holden, D.F.C., A. W. Holt, R. A Hudson, W. T. Joyce, R. J. Longstaff, W. H. Morton, A. E. Murdock, T. M. Murray, E. H. Rawls, K. J. Salisbury.

R.A.F. REGIMENT.

Flying Officer: D. G. Vince.

Pilot Officer: R. Hardy.

AIRCRAFT CONTROL BRANCH.

Squadron Leaders: S. H. Troughton-Smith, T. J. Watkins, D.S.O.

Flight Lieutenants: P. D. S. Bennett, D.F.C., C. Brooks, J. K. Burrell, E. A. Clerk, F. J. Crewe, T. M. Gethings, A. d'L. Greig, D.F.C., L. Hutton, J. H. Lowes, A.F.C, G. McPherson, A.F.M., A. Y. Mason, R. Mather, D. H. A. Moore, D.F.C., D.F.M., E. F. Nicholas, R. D. Phillips, G. W. Rymer, J Tinsley, D.F.M., C. P. Waddell.

MARINE BRANCH.

Flight Lieutenant: L. G. E. Ambler.

MEDICAL BRANCH.

Squadron Leader: E. W. R. Fairley, M.R.C.S., L.R.C.P.

Flight Lieutenants: W. E. Hassan, M.B., B.S., R. C. Robb, M.B., Ch.B.

DENTAL BRANCH

Flight Lieutenants: A. F. Clegg, L.D.S., J. B. Karran, L.D.S., R.C.S., P. O. Wilson. L.D.S., R.C.S.

CHAPLAINS' BRANCH.

The Reverends: A. T. Clark, O.B.E., H. W. R. Cullen, B.A., D. St. C A. Frizzelle, D. M. Harper, S. W. Harrison, G.M., R. S. Meadows, C. E. Moxley, J. M. Payne, T. I. Robinson, T. E. Warner, M.A., B.D., B. Litt (all C. of E.).

EDUCATION BRANCH.

Flight Lieutenants: I. Drummond, M.A., E. Essame.

Flying Officer: J. B. L. Bunce, M.A.

PROVOST BRANCH.

Flying Officers: B. W. Green, W. I. O'Neill.

CATERING BRANCH.

Flight Lieutenants: J. R. Molyneux, K. E. Wooldridge.

Flying Officers: L. Penny, R. G. Preece, R. A. Targett.

PHYSICAL FITNESS BRANCH.

Flight Lieutenants: J. A. H. Armstrong, L. C. Boore, D.F.M., W. Wright.

Flying Officers: J. A. M. Davies, E. Rutter.

Reunions

THE reunion dinner for No. 250 (Sudan) Squadron, R.A.F., will be held at 7.30 p.m. on April 2nd, at the Griffin Inn, Villiers Street, Charing Cross. Particulars from R. Still, 122, Windmill Street, Gravesend, Kent.

An annual reunion for all members of No. 221 Squadron O.C.A. will be held on March 19th. Tickets 6s 6d each and further information from H. N. Crawshaw, 50, Elliscombe Road, Charlton, S.E.7.

* * *

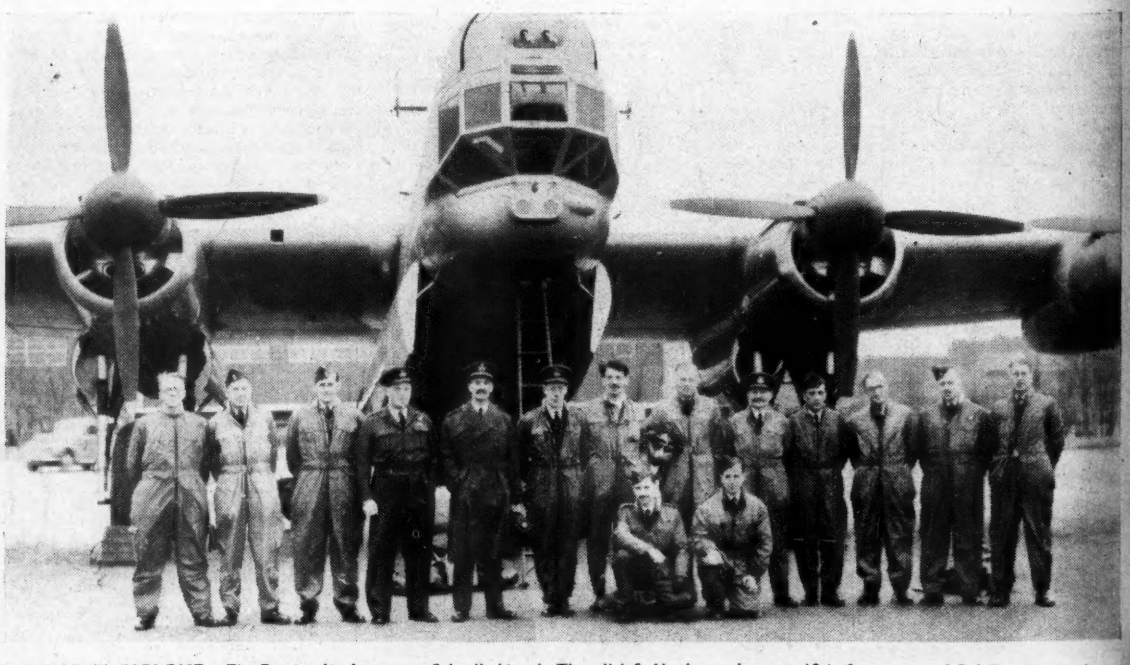
The third annual reunion dinner of the Aspian Society, for former officers and airmen of 91 Air Stores Park (Bengal, Malaya, and Japan), is to be held at the Holborn Restaurant, Kingsway, W.C.2, on March 26th. A.V-M. C A. Bouchier, C.B., C.B.E., D.F.C., will be the guest of honour. Tickets 17s 6d exclusive of drinks. Those wishing to attend should notify S/L. D. A. de S. Young-James, Air Ministry (E.25), 29-33, Draycott Place, S.W.3.

* * *

Officers who served on the Cocos Islands during the war decided at their first reunion, held recently, to hold an annual all-ranks reunion for members of all Services who were stationed there. The reunion, which is being organized by S/L. D. Martin Butcher, O.B.E., will be held at the Victory Club, Seymour Street, Marble Arch, London, on Friday, March 11th, at 6.30 p.m. Tickets, 10s each, and information from the Organizing Secretary, Cocos Islands Reunion, Air Ministry, 312, Bush House (S.E.), Strand, W.C.2.

* * *

An officers' reunion (wartime) R.A.F., W.A.A.F., Dominion, and Allied, for 25 Group Headquarters and Units will be held at Milestone Hotel, Kensington Court, at 6.45 p.m. on March 25th. Buffet supper 7s 6d, payable on arrival; lounge suits. Apply to A.V-M. E. D. Davies, Room 449, Shell Mex, W.C.2, who requests that envelopes be marked "25."



"THOR II" GOES EAST: The Empire Air Armament School's Lincoln Thor II left Manby on January 18th for a tour of R.A.F. units in the Middle and Far East, carrying representatives of the Ordnance Board to examine the condition of explosives stored in those areas. Shown above are the crew and members of the board before departure; fifth from the left is G/C. Beresford-Pierse, leader of the ordnance team, and on his left is W/C. Weir, captain of the aircraft.